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Developments in Western Europe that influence the market for United States exports are outlined in the first article in this issue. A study of these developments will aid in an appraisal of the current proposals to revise our foreign trade policy. During the last decade there has been a trend toward economic self-sufficiency in Western Europe. The author takes this trend as well as other factors into account in evaluating the prospects for Western European imports. This article is a continuation of the analysis by the same author in the January issue.

Both farmers and consumers have a stake in achieving low-cost production in agriculture. For individual farmers, lower costs increase income. For consumers, increased production efficiency is reflected in a lower food bill. A common prescription for lowering cost per unit of product is to increase farm size. The second article in this issue investigates this cost-size relationship but also explores the scope for lowering costs by better use of the set of resources that the farmer already has on hand. This latter alternative should not be overlooked in planning the farm business.

In recent discussions of agricultural policy, Denmark has been cited as an example of how government regulations affect the welfare of farm people. The third article presents an account of the development of Danish agriculture and indicates how the Danish farmer has fared under a system that has no comprehensive governmental farm program. The manner in which Danish farmers have adjusted to changing markets and technology is outlined. The authors provide an answer to a question that frequently puzzles observers from other countries: How do small- and medium-sized family farms remain in business without subsidy?

The final article presents an analysis of the changes that are taking place in livestock production. Attention is focused on adjustments made by individual farmers in the sizes of their hog and feeder-cattle enterprises. Three areas of Illinois were studied and important differences were found in the direction and rate of change in livestock production. By use of the idea of "equilibrium," the authors indicate the likely direction of future changes in size of livestock enterprises. The analysis suggests that farmers who diversify by feeding both hogs and cattle will continue to be a strong element in the livestock economy.

The Impact of Western European Integration on U.S. Exports: Part II

S. C. SCHMIDT

PART I OF THIS ARTICLE GAVE a brief account of the principal economic and institutional factors shaping the prospective course of Western European import demand in general and its implication for the United States in particular. Part I gave a broad idea of the forces generating imports and the repercussions of economic integration which might make them ineffective. The article serves as a background for the following discussion of changes in the volume and pattern of Western European imports by major commodity aggregates.

Trends in Aggregate Imports

In 1960 aggregate imports of OEEC (Organization for European Economic Cooperation) countries were some 63 percent above the level of 1951. As the figures in Table 1 indicate, the expansion was not a continuous process but had

alternating phases of reversals and recoveries. Taking cognizance of major turning points in the import flow, the analysis that follows deals with (1) the post-Korean recession (1952-1953), (2) economic expansion and full employment (1954-1957), (3) the recession of 1958, and (4) the upswing of 1959-1960.

Post-Korean recession. While from 1947 to 1950, the pace was set by the strong surge in demand accentuated by over-all shortages and reconstruction needs, the Korean War changed the order of priorities. Imports based on defense requirements, speculative buying, and stock piling became more important. The passing of the emergency was naturally followed by subsequent reductions in demand, leveling off in production, and stock liquidation. These general contractionary tendencies were also transmitted to the international commodity

Table 1. — Commodity Composition of OEEC Imports by SITC Sections 0-9^a

Commodity	SITC section	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	Rate of change 1951-1960	Share of total imports 1951	1960
(million dollars c.i.f. ^b)												(percent)	(percent)	
Food.....	0	7,526	7,467	7,567	7,930	8,502	9,342	9,529	9,387	9,833	10,158	35	22.4	18.6
Beverages and tobacco	1	770	733	821	887	969	976	1,122	1,232	1,060	1,249	62	2.3	2.3
Oils and fats.....	4	876	620	568	607	653	734	756	604	643	743	-15	2.6	1.4
Subtotal.....	0+1+4	9,172	8,820	8,957	9,424	10,124	11,053	11,407	11,223	11,536	12,150	32	27.3	22.2
Raw materials.....	2+3	13,936	12,485	11,594	12,209	14,029	15,344	17,288	14,369	14,277	16,594	19	41.6	30.4
Manufactures.....	5-8	10,407	10,727	10,653	12,054	14,531	16,181	17,639	17,664	20,203	25,860	148	31.1	47.4
Total.....	0-9	33,515	32,032	31,204	33,687	38,684	42,578	46,334	43,263	46,016	54,604	63	....	....

^a Commodity aggregates conform with the ten sections of the Standard International Trade Classification (SITC) developed by the United Nations in the post-World War II years. In addition to the ten sections, the SITC divides commodities into 52 divisions (two-digit code), 150 groups (three-digit code), and 570 items (five-digit code). Section O, for instance, includes 36 different groups of food elements compared with four and three groups making up sections 1 and 4, respectively. For a complete commodity coverage of the various sections listed in Table 1 see Statistical Office of the United Nations: Commodity Indexes for the Standard International Trade Classification, Statistical Papers, Series M., No. 10 (New York, 1953).

^b Cost, insurance, and freight.

Source: OEEC Statistical Bulletins, *Foreign Trade*, Series IV and Series B.

exchanges. This resulted in a 7-percent fall in imports between 1951 and 1953.

Economic expansion and full employment. Imports rose steadily from 1954 onward by about \$3.8 billion a year. By the end of 1957, imports had reached the impressive amount of \$46.3 billion. Over the period considered, the increase amounted to 48 percent. The main supports of economic activity and consequently of imports during the 1954-1957 period were well-conceived government policies. These policies successfully contributed to restoring an adequate rate of growth in the wake of the imbalance created by the post-Korean recession. In this context the pent-up demand for consumers' durable goods and investments and the concurrent relaxation of restraints facilitated an investment boom of unprecedented magnitude.¹ The major policy changes were the easing of controls on consumer credit, the subsidization of residential construction, the raising of depreciation allowances, and the reduction of taxes imposed on investments.

Energetic measures were also taken to stimulate international trade, particularly among the 17 member countries of the Organization for European Economic Cooperation (OEEC). Quantitative restrictions which had inhibited economic expansion were lowered further. This brought the level of liberalization on trade among member countries from 65 percent in 1953 to 86 percent at the end of 1955. Likewise, substantial liberalization was accorded to dollar imports, extending from 11 percent in 1952 to 54 percent at the close of 1956.

¹ For a more comprehensive treatment of the pattern and factors underlying Western European economic growth, see OEEC, Tenth Annual Economic Review, *Policies for Sound Economic Growth*, Paris, March, 1959, Chapters 2 and 3.

After two years of uninterrupted growth in over-all economic activity and despite the support given to the expansion by a simultaneous rise in imports, inflationary forces began to assert themselves. The inflationary process gained momentum from the Suez crisis and consequent surge in demand as well as from rising import prices. On the whole, however, the pressures did not originate from external impulses as was the case in the years 1950-1951, but from excess domestic demand. As a result concern was voiced that, unless government policy were shifted toward restraint, the pace of expansion, both in the factor and product markets, might lead to a state of over-demand culminating in an inflationary spiral.

Subsequent measures of policy were introduced to bring aggregate demand in line with available current resources, including imports. These measures included over-all monetary stringency supplemented by quantitative credit controls, fiscal measures (indirect taxes) aimed at discouraging personal consumption, and the slowing down of movements toward free trade and payments between 1955 and 1957.

The recession of 1958. It became apparent by the closing months of 1957 that the anti-inflationary measures applied in the preceding years were taking effect and the pressures of demand receded. The timing and extent of downturn in general economic activity varied from one country to another. However, in the course of 1958 the contracting forces concentrated on two main categories of aggregate demand: fixed investment (manufacturing) and private consumption. Considerable stock liquidation also took place.² The industrial

² See OEEC, Statistical Bulletins, *General Statistics, Main Economic Indicators*.

sectors hardest hit were coal, iron, steel, textiles, building, and transport. The recessionary influences in these industries were accompanied by a general easing of import demand and a fall in overseas demand for exports. Indeed, after rising particularly fast since 1954, total imports during 1958 declined by over 6 percent in all commodity groups but manufactures.

The upswing of 1959-1960. During this period aggregate imports trended upward again, reflecting as well as contributing to the pace of economic advance. The main impetus to the upturn in imports came from the six Common Market (EEC) countries and the United Kingdom. There was a sharp expansion in domestic demand, industrial production, and exports.³ Moreover, the general recovery was also aided by the relaxation of restrictive monetary and fiscal policies that had been in force since 1957. Imports were especially buoyant throughout 1960, rising by more than 18 percent. It may be added that this expansion was well balanced. Apart from oils and fats and raw materials, all major commodity groups had passed previous peaks by the end of 1960 (Table 1).

Commodity Structure of OEEC Countries' Imports

OEEC countries' imports have followed a course determined by the combination and scope of (1) autonomous changes in economic activity, (2) governmental policies affecting the level of both domestic and international transactions, and (3) changes induced by such factors as weather and the Korean and Suez crises. These broad influences which have acted upon the level of aggregate imports have also, though to a varying degree, been reflected in the experience

of major commodity groups. A glance at the commodity structure of imports reveals that foods including oils and fats and raw materials rather than manufactures were the more volatile elements of change.

Not all major commodity groups shared equally in the expansion exhibited by aggregate imports (Table 1). In general, the rate of increase in all commodity groups except manufactures tended to be lower than that of the aggregate, while the value of oils and fats imported was actually 15 percent below the 1951 level. The shift in the order of importance of these commodities in the import flow is more relevant than differential rates of growth in assessing structural change.

Foods (SITC Section O)⁴ accounted in 1960 for about 19 percent of member countries' total imports or somewhat less than in 1951, when the figure was 22 percent (Table 1). In contrast, beverages and tobacco held their own, accounting for a little over 2 percent of all commodities imported in 1951 and 1960. The third food element, oils and fats, suffered the biggest setback, losing almost half of the share of aggregate imports that it held in 1951. When these three commodity groups are lumped together into a single composite food category, they accounted for approximately 22 percent of total imports in 1960 or 5 percentage points less than in 1951.

The share of raw materials in total imports also fell heavily. Whereas raw materials represented 42 percent of all imports in 1951, their contribution by 1960 declined to 30 percent. It is interesting to compare this change in the position of raw materials with the increasing part played by manufactures. Imports of manufactures have risen 148 percent, and as a result their share of

³ See OEEC, Statistical Bulletins, *General Statistics*.

⁴ See Table 1, footnote a.

Table 2. — Income Elasticities of Demand for Food (Quantity)

Commodity	ECE/FAO (1960) ^a			Yates ^b (1960)	ECE ^c (1957)
	Southern Europe	European Economic Com- munity	Other North- western Europe	Western Europe	Western Europe
Cereal.....	-0.02	-0.27	-0.32	-0.25	-0.20
Potatoes.....	-0.07	-0.27	-0.26	-0.20	-0.20
Sugar.....	0.83	0.47	0.13	0.50	0.30
Fruit.....	0.34	0.42	0.48	0.70	0.50
All milk products.....	0.32	0.23	0.19	....	....
Liquid milk.....	0.31	0.15	-0.03	0.10	0.10
Cheese.....	0.39	0.40	0.26	....	0.30
Butter.....	0.34	0.27	0.45	0.30	0.10
Other milk products.....	0.39	0.32	0.42	....	....
Fats and oils (excluding butter).....	0.46	0.27	0.23	0.20	0.20
Eggs.....	0.71	0.43	0.32	0.60	0.50
Meat (all kinds).....	0.70	0.47	0.39	0.60	0.70
Beef and veal.....	0.49	0.55	0.42	....	....
Pulses and nuts.....	-0.20	-0.20	-0.20	....	-0.10 ^d
Vegetables.....	0.13	0.13	0.13	0.30	0.20

^a Derived from ECE/FAO, *European Agriculture in 1965*, Geneva, 1960.

^b P. Lamartine Yates, *Food, Land and Manpower in Western Europe*, London, 1960 (Chapter 4).

^c *Economic Survey of Europe in 1957* (Annex to Chapter V).

^d Pulses only. Pulses include peas, beans, lentils, etc.

Source: UN, *Economic Survey of Europe in 1960*, Appendix B, p. 10.

total imports increased from 31 percent to 47 percent in the period under consideration.

Pattern of food imports. Between 1951 and 1960 food imports increased by 35 percent. This is considerably lower than the increase exhibited by either beverages and tobacco or manufactures (Table 1). Notwithstanding the relatively low rate of growth, food imports maintained a steady upward trend interrupted only twice (1952 and 1958) by minor setbacks of 0.8 and 1.5 percent, respectively.

Another facet of the pattern is the declining relative importance of food in the international trade of member countries. As indicated above, the share of food in total imports declined from 22 percent in 1951 to 19 percent in 1960 (Table 1). Available evidence⁵ suggests

⁵ For a detailed exposition of changes in the pattern of trade in foods and individual commodity items, see Erik Thorbecke, *The Pattern of World-Trade in Foodstuffs: Past and Present*, Iowa State University, February, 1962 (mimeo).

that this change is not a recent phenomenon but reflects tendencies apparent in previous years. The principal factors underlying this change appear to be: (1) the low income elasticity of demand for food; (2) national policies aimed at stimulating agricultural production; and (3) economies in the processing and distribution of foods.

Income elasticity of demand for food. Although the trend in consumption will differ both within and between food categories, aggregate food imports may not be expected to increase at the same rate as personal income. As the income elasticities in Table 2 indicate, a given percentage increment in per capita income is not associated with an equal percentage rise in the consumption of any of the listed commodities. A broad distinction can be drawn between starchy and nonstarchy foods. The income elasticities for physical quantities of starchy foods such as cereals and potatoes are negative for all western European re-

Table 3. — Production of Selected Agricultural Commodities by OEEC Member Countries^a

Commodity	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	Rate of change
	(thousand metric tons)										(percent)
Wheat.....	32,343	33,202	37,091	40,357	38,901	41,992	36,558	45,458	44,913	46,164	43
Rye.....	6,647	6,559	6,939	7,087	7,762	6,954	7,371	7,515	7,410	7,387	11
Rice.....	1,234	1,393	1,705	1,770	1,731	1,688	1,492	1,537	1,619	1,580	28
Barley.....	11,751	13,895	15,529	16,723	15,599	17,068	21,309	20,211	20,428	22,754	94
Oats.....	13,806	14,680	14,413	14,806	13,882	14,200	15,364	12,504	12,283	12,104	-12
Corn.....	4,328	5,780	5,282	6,394	6,489	6,695	7,622	7,277	7,990	8,712	101
Oilseeds.....	1,101	1,356	1,375	1,048	1,098	1,258	1,142	1,326	1,338	1,359	21
Meat and edible offal	9,807	10,216	11,984	12,690	13,479	13,694	14,046	14,813	14,964	15,585	59
Beef and veal.....	3,722	3,798	4,031	4,485	4,877	4,757	4,854	5,156	5,003	5,209	40
Pork.....	3,645	3,946	4,521	4,635	4,909	5,145	5,274	5,549	5,652	5,805	59
Eggs.....	2,345	2,324	2,446	2,593	2,701	2,697	2,895	2,941	3,112	3,257	39

^a Years ending June 30.
Source: OEEC, Statistical Bulletins, *General Statistics*, 1960, Nos. 4 and 5.

gions. Consumption of these commodities actually declines, although at varying degrees, as per capita income rises.

The elasticities for dairy products and fats and oils are considerably higher, and those for eggs, meats, and fruits show the highest responsiveness to changes in per capita incomes. In all OEEC member countries fewer calories are currently obtained from cereals and potatoes and more from protective foods such as livestock products, fruits, and sweets. The shift away from starchy foods is much more pronounced in the industrialized countries of EEC and other northwestern European countries (i.e., dollar customers) than in southern Europe.⁶ This shift in consumption pattern may serve as a partial explanation for the fact that member countries' import demand for U.S. foods declined over the 1951-1960 period, despite the growth of per capita incomes within the region as a whole.

Trends in agricultural production. The last decade has seen considerable advance in European agriculture, a development which received an important stimulus from government policies (Ta-

ble 3).⁷ Policies aimed at increasing production have been motivated by (1) a desire to shift from external to internal sources of supply (autarky); (2) an attempt to narrow the gap between farm income and income of other occupational groups; and (3) a host of other economic, social, and political considerations. The domestic price support measures⁸ in combination with external protection⁹ and other structural adjustments took effect to such an extent that it has now been found necessary in some exporting countries to check the rate at which the supply of specific commodities is growing. While it is difficult to assess the quantities involved, a substantial part of the increment in output gains (2.8 percent per year) can be attributed to improved farm organization and the con-

⁷ For a review of the agricultural policies followed by member countries with regard to production, prices, and foreign trade, see OEEC, *Agricultural Policies in Europe and North America*, Paris, May, 1956, and subsequent annual reports. GATT, *International Trade 1959*, Geneva, 1960.

⁸ S. C. Schmidt, The Impact of Western European Integration on U. S. Exports: Part I, *Illinois Agricultural Economics*, Vol. 2, No. 1, January, 1962, Tables 4 and 5.

⁹ For a detailed summary of tariff structures of OEEC countries by major commodity categories, agricultural or nonagricultural, see Political and Economic Planning, *Tariffs and Trade in Western Europe*, George Allen and Unwin, Ltd., London, 1959.

⁶ For additional empirical evidence pertaining to changes in consumption levels of selected food items, see OEEC Statistical Bulletins, *Agriculture, Production and Consumption*, Paris, 1961, Table 20, p. 45.

centration of investments on raising resource productivity.

The number of tractors and the amounts of fertilizer applied increased substantially compared with pre-World War II conditions. Production of grains and livestock also increased. Fertilizer consumption per hectare was almost 50 percent greater in 1950-1951 than pre-war and about 116 percent greater than pre-war in 1958-1959. The number of tractors in service within the whole area has approximately tripled since 1950, giving an average of 21 tractors for each 1,000 hectares in 1958-1959.¹⁰ In general, the rate of increase of productive investment maintained by most Western European countries during the past decade caused important changes in the relationship of capital to labor in agriculture and hence there is some assurance that technical progress will continue.¹¹

Important strides have also been achieved in relation to labor productivity. Under the pressure of full-employment conditions, member countries were forced to turn toward agriculture as the main source of industrial recruitment. The ensuing movement from farming to other occupations in turn speeded up mechanization and contributed to higher labor productivity in agriculture.¹² So long as manpower needs can be adequately replenished from agriculture, the scope for maintaining a high rate of over-all expansion in the three major industrial countries, France, Germany, and the United Kingdom, seems assured.

It must be recognized, however, that there was an increase in movements of workers from one European country to

another, although in absolute figures such movements still remained slight. According to recent official estimates, farm population during the past decade in ten northwestern European countries declined by over 20 percent. This represents some 15.7 million or about 19 percent of total population. The decline varied from 5 percent in the United Kingdom to nearly 40 percent in Ireland.¹³

The increases in labor productivity have not been general, not only because the progress in agricultural production has been uneven in different countries, but because the countries where agriculture is predominant in the national economy have not always realized the greatest increases in productivity. It must be recognized also that on account of manifold social and economic conditions, which have shaped the present agricultural structure, no fast progress in raising productivity commensurate in scope with that achieved in the United States should be expected.

While the importance of production gains realized by capital investments is impressive, sustained growth cannot be maintained without further structural adjustments. These will involve concerted actions in a number of areas encompassing land tenure, redistribution and consolidation of land, development of agricultural advisory services, and improved credit facilities.

Sources of Imports to OEEC Countries

Food imports. Since 1951 imports from certain regions have increased at a much faster rate than from others. The striking feature of these changes has

¹⁰ See UN, FAO, *European Agriculture in 1965*, Geneva, 1961, Annex I, pp. 4-7.

¹¹ *Ibid.*, Annex II, p. 3.

¹² UN, *Economic Survey of Europe in 1956*, Geneva, 1957, Chapter 7, and UN, *Economic Survey of Europe in 1958*, Geneva, 1959, Chapter 2.

¹³ OEEC, *Agricultural and Food Statistics*, Paris, 1959, Table 5, p. 8, and UN, FAO, *Trends in European Agriculture and Their Implications for Other Regions*, *Monthly Bulletin of Agricultural Economics and Statistics*, 9:11, p. 3.

Table 4. — Geographical Distribution of OEEC Commodity Imports

SITC Section	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	Rate of change 1951- 1960	Share of com- modity imports		
												1951	1960	
												(percent)		
(million dollars c.i.f.)												(percent)		
Intra-OEEC														
Food.....	0	2,110	2,019	2,091	2,271	2,488	2,634	2,830	2,793	3,017	3,507	66	28	34
Beverages and tobacco....	1	177	196	207	225	250	281	305	332	295	391	121	23	31
Oils and fats.....	4	194	160	127	152	151	176	149	133	141	209	8	22	28
Raw materials.....	2+3	3,162	3,246	3,314	3,528	4,046	4,371	4,558	3,968	4,085	4,814	52	23	29
Manufactures.....	5/8	7,358	7,550	7,789	8,751	10,224	11,600	12,799	12,940	14,890	18,308	149	71	71
United States														
Food.....	0	1,087	829	578	457	769	1,055	862	715	928	938	-14	14	9
Beverages and tobacco....	1	259	150	245	242	254	241	267	271	245	311	20	34	25
Oils and fats.....	4	96	58	59	108	115	143	177	112	115	139	45	11	19
Raw materials.....	2+3	1,649	1,467	856	1,105	1,549	1,954	2,977	1,679	1,171	1,691	3	12	10
Manufactures.....	5/8	1,326	1,453	1,228	1,394	1,820	1,933	2,176	2,031	2,227	3,665	176	13	14
Canada														
Food.....	0	490	635	599	417	466	555	456	489	492	467	-5	7	5
Raw materials.....	2+3	328	390	260	315	422	435	491	400	305	425	30	2	3
Manufactures.....	5/8	267	375	384	355	465	458	461	526	528	750	181	3	3
Eastern Europe														
Food.....	0	315	366	233	206	210	274	261	317	421	457	45	4	5
South America														
Food.....	0	767	710	896	1,105	985	1,103	1,168	1,149	1,169	(a)	52	10	12
Oceania														
Food.....	0	610	675	817	736	816	872	784	705	847	(a)	39	8	8

^a Not available.
Source: OEEC, Statistical Bulletins, *Foreign Trade*, Series IV and Series B.

been the apparent tendency toward a concentration on intra-OEEC supplies at the expense of those coming from the United States and Canada in particular (Table 4). Imports derived from the remaining regions, with the exception of those from South America, were relatively small although each of them succeeded in improving its respective share in member countries' food trade.

Intra-OEEC food trade. Western Europe's gains in agricultural self-sufficiency have affected the magnitude and the regional distribution of imports. The extent of this may be seen from the fact that, apart from oils and fats, intra-OEEC transactions in foods, beverages, and tobacco exhibited the highest growth rate among the major sources of imports listed in Table 4. Trade in these commodities, disregarding the temporary reverses suffered in 1952 and 1958 (foods) and in 1959 (beverages and tobacco), continued to increase over the period under review. While quantitative restric-

tions and tariffs maintained by the principal importing countries of OEEC constituted the most formidable obstacle to intra-member trade in food during the 1951-1953 period, lower exportable surpluses caused the decline in 1958.

In contrast to the industrial countries, which are predominantly producers of raw materials and manufactures, over two-thirds of the output and exports of Denmark, Greece, Iceland, Ireland, Portugal, Spain, and Turkey consists of primary products among which foods, including beverages and tobacco, are preponderant. Thus changes in the rate of growth of intra-member food trade will, to a large extent, reflect the trade liberalization policies pursued by the net food-importing countries of northwestern Europe. As a corollary, changes in intra-member trade in nonagricultural commodities will also be conditioned by the level of food exports of the primary commodities-producing countries of southern Europe. Insofar as restrictions

on intra-member food trade reduce the ability of these countries to purchase needed consumer and capital goods, expansion of trade in the latter commodity groups will also be hampered.

It may be noted that almost the entire drop in food trade in 1958 may be ascribed to lower outputs of cereals and dairy products. Although aggregate production was satisfactory, the output of cereals fell below that of the previous year as a result of poor weather conditions in the summer of 1958, while fruit crops and animal production continued to expand.¹⁴ In contrast, the marked revival in intra-member trade during the following year was helped by increases in cereal production in western and northern Europe, which apparently more than offset the smaller output realized in the southern European grain-producing countries.

The trend toward an intensification of intra-member trade became particularly visible by 1960, when exchanges in foods and beverages and tobacco accounted for 34 and 31 percent of all such imports compared with 28 and 23 percent in 1951, respectively (Table 4). From the available evidence it is difficult to tell how far the pattern of trade has been affected by the trade liberalization policies promoted by the OEEC, GATT,¹⁵ and EEC, by domestic policies of self-sufficiency, and by the rise in productivity.

Food imports from the United States. Movements in food imports from the United States showed widely divergent tendencies but generally followed a downward course. Imports de-

clined by 14 percent in value between 1951 and 1960 and, as a result, the U.S. share of total OEEC food imports has fallen from 14 to 9 percent. During the corresponding period the position of beverages and tobacco also weakened. As is evident from Table 4, imports of these commodities, apart from making a sluggish headway in 1960, have remained at a virtual standstill during the intervening years. In consequence, the share of U.S. beverages and tobacco declined from a high of 34 percent in 1951 to 25 percent in 1960 (Table 4). On the other hand, disregarding the fluctuations caused by temporary and cyclical factors, imports of oils and fats from the United States at the end of 1960 were some 45 percent above the 1951 level. Due to this remarkable rate of growth, the United States was able to enlarge its share from 11 percent to 19 percent in this period.

The level of food imports from the United States reached the low point for the period in 1954 but began to recover again in the course of the following two years. In spite of these gains, however, the value of food imports in 1956 was still somewhat below the peak established in 1951. Thereafter the level of food imports declined in 1957 and 1958 and increased in 1959 and 1960.

Between 1951 and 1954 member countries' imports of foods from the United States declined by over 58 percent. This drastic fall reflects both the sensitivity of agricultural output to changes in weather conditions and the responsiveness of individual farm enterprises to investments designed to enhance productivity. To illustrate, agricultural output at the end of 1954 was some 29 percent above its pre-World War II level.¹⁶ This has been

¹⁴ OEEC, Eleventh Annual Economic Review, *Europe and the World Economy*, Paris, April, 1960, Table 6, p. 57.

¹⁵ General Agreement on Trade and Tariffs signed in 1947 by 38 countries involving two-thirds of the world trade.

¹⁶ OEEC, Sixth Report of the OEEC, *From Recovery Towards Economic Strength*, Volume I, Paris, March, 1955, Chapter 1.

an impressive accomplishment, even considering that the cultivated area in member countries increased by 10 percent during the corresponding period.

Interestingly, the highest rates of expansion were for products for which member countries have had the highest degree of dependence on the United States for their import requirements. Thus the exceptional advances in agricultural output, partly engendered by the very favorable climatic conditions during the 1952-1954 period, have made for a considerable reduction in the imports of foods relative to pre-1952 levels of transactions. The bumper crops of 1953 increased total agricultural output in that year alone by 7 percent. Livestock production also expanded, further reducing imports from both the United States and Canada in the following year. Agricultural output of member countries in 1955 showed mixed trends; cereal harvests were of improved quality and volume in the Common Market countries. But elsewhere, especially in Scandinavia, crop output remained below average on account of summer drouth. Among cereals output of wheat was the most satisfactory and the region as a whole registered export availabilities. Meat production, particularly pork, also gained in 1955. Other food items did not share in the expansion, and output actually dipped below the 1954 levels. The net effect of these diverse supply movements was a rise in dollar food imports.

A substantial part of the higher food imports in 1956 represented marginal requirements to meet shortcomings arising from a poor wheat crop, frost damage on olive and fruit trees as well as the disposal of surplus agricultural commodities under Public Law 480. On the whole, the volume of agricultural production in 1956 showed no rise above

that of the previous year. In contrast, following a fairly satisfactory harvest in 1957, imports of coarse grains declined again.

Between 1959 and 1960 imports were unchanged. Agricultural production within OEEC was characterized by two main features: smaller wheat crop of a generally low quality, and a favorable output of feed grains, notably barley and corn. As a result of bad weather conditions, the 1960 wheat yields were not only lower than those in 1959, but by virtue of higher moisture content also less suitable for human consumption. Yet, in spite of lower wheat output, considerable surpluses remained seeking either domestic or foreign outlets. Due to the difficulties involved in disposing of wheat in world markets already glutted by surpluses from the western hemisphere, part of this wheat was diverted into feed uses. The combined effect of these developments on member countries' cereals trade was a rise in import demand for high-quality wheat, both soft and hard wheat varieties, and a simultaneous fall in feed-grain import needs.

A word of caution should be introduced relating to the interpretation of changes in supply conditions and their impact upon the structure and geographical distribution pattern of food imports. Due to differences in methods of recording (crop year versus calendar year), year-to-year fluctuations in supply may not necessarily have a direct relation to imports. That is, any carryover of stocks from a good to a poor harvest year raises the availability of supplies of the latter year and hence reduces the demand for imports. In this context, agricultural output remains an unreliable indicator of prospective movements in imports.

All things considered, the 14-percent decline in food imports between 1951 and

1960 represents a trend towards an import-saving agricultural production accentuated by dietary changes causing a fall in the consumption of grains, the bulk of which had been supplied by the United States.¹⁷ Hence, the prevailing trend in import demand for U.S. foods cannot be expected to be significantly reversed even under a phase of continued economic growth and rising personal incomes unless national policies of self-sufficiency give way to a production and trade pattern based on competitiveness. The chances for such a turn of events are slim indeed, and thus the future demand for U.S. foods will, as has been true in the 1950's, depend largely upon the course of intra-OEEC production.

Intra-OEEC raw-material trade. Apart from the setback suffered in 1958, intra-OEEC trade in raw materials between 1951 and 1960 showed a strong and continuous growth, and by the end of the period its level was about 52 percent above that of 1951. A striking feature of the post-Korean recession was that much of the decline in imports had fallen on raw materials (and foodstuffs) purchased from the dollar area while trade among member countries continued to increase at a moderate pace.¹⁸

An important element in these developments has been the concern with the improvement of Western Europe's overall balance-of-payments position in which reduction of dollar imports played a pivotal role. Subsequent growth in raw-material imports was facilitated by expansion in industrial activity and gradual removal of restriction on trade among

member countries.¹⁹ Intra-OEEC raw-material trade fell by over 13 percent in 1958. This reflected the weakening of demand in the major raw-material-using industries, which in turn depressed the demand for coal, iron, steel, and cotton.²⁰

In addition, France and the Netherlands were faced with an external imbalance. They introduced import-restraining measures designed to curb aggregate demand and thereby remedy the situation. In consequence, other member countries' exports to France fell by 14 percent and those to the Netherlands by 17 percent. Among member countries the repercussions for the United Kingdom and Belgium were most severe. Since 1959 intra-member trade in raw materials continued to rise and by 1960 stood at \$4.8 billion.

During the period under consideration, the movement towards a concentration on internal supplies of raw materials received stimuli from the progressive breaking down of quantitative barriers against imports from other member countries,²¹ and subsequent tariff cuts and quota enlargements implemented by the six Common Market countries.²²

¹⁹ For a stage-by-stage elimination of intra-OEEC trade impediments see OEEC's annual economic reviews.

²⁰ See OEEC, Statistical Bulletins, *General Statistics*.

²¹ Schmidt, *The Impact of Western European Integration on U.S. Imports: Part I*, Table 6.

²² It may be added that the initial 10-percent cut in tariffs (January, 1959) was unilaterally extended to all GATT members and to other countries enjoying most-favored-nation treatment, on those commodities that had a duty higher than the proposed common external tariff of the EEC. Moreover, effective January, 1959, all existing bilateral quotas applied against industrial products in intra-EEC trade have been made available to all member countries and their level raised by 20 percent. The same benefits have been offered to other OEEC countries on a reciprocal basis.

¹⁷ OEEC, Statistical Bulletins, *Foreign Trade*, Series IV and Series B.

¹⁸ The extent to which trade liberalization measures had been applied as regulatory devices between 1952 and 1954 can be seen in OEEC, Sixth Report of OEEC, *From Recovery Towards Economic Strength*, Volume I, Paris, March, 1955, Tables 24 and 25, pp. 128-130.

Thus while liberalization measures have been extended on imports from member countries themselves, an important degree of discrimination against dollar goods still persists.

Raw-material imports from the United States. From 1952 onward there were fairly widespread signs of an end of the post-Korean boom and the appearance of a recession in economic activity. The cumulative effects of the dislocations resulting from the Korean War, balance-of-payments difficulties, low foreign-exchange reserves, and reimposition of trade restrictions had become substantial. They manifested themselves in a 48-percent decline in raw-material imports from the United States between 1951 and 1953 (Table 4).

Throughout the region there was a sharp reduction in the rate of growth of total industrial output, and in several member countries output even declined during 1952. Consumer-goods industries and textiles not only led the onset of the boom but also ushered in the subsequent general slackening. The trend reversed in 1953 when the industrial production in member countries combined rose by 5 percent.²³ Taking the lead in the incipient revival of economic activity were consumer goods, automobiles, and chemical products. In contrast output stagnated in the investment-goods sectors and the metal and coal industries.

The period 1954-1957 was one of sharp contrasts and may be regarded as the most expansionary phase in raw-material trade with the United States. Member countries' imports increased from \$856 million in 1953 to \$2,977 million in 1957, or by 248 percent. As data in Table 4 indicate, imports during this period exhibited extreme fluctuations,

and as such reflect the interaction of economic and institutional forces.

In the early stages of the Western European boom, the resurgence of consumers' purchases of durable goods, demand for residential housing, fixed investments, and exports were the principal forces of expansion. The remarkably rapid growth of demand in turn caused strains on the supply of raw materials supporting the output in key sectors of manufacturing industries of the more industrialized countries of the area. Since raw-material requirements, particularly fuels, steel, scrap, and nonferrous metals, were rising much faster than indigenous supplies, imports of these products have been commensurately increased.²⁴

During the economic upswing in 1954, imports of raw materials from the United States and Canada grew in step with industrial production, but those obtained from either intra-OEEC sources or from third countries increased at a slower pace. The apparent preference expressed toward dollar sources of supply reflects the complementary roles played by reduction of dollar import restrictions and the higher supply elasticity of the products of these regions.

While raw materials as a whole fared better than manufactures, there were important changes in the positions of individual commodity groups between 1954 and 1957. Imports of cotton for instance which in 1954 had risen by \$140 million above their 1953 level suffered a severe setback in the order of \$236 million in 1955 but rallied subsequently and by the end of 1957 had reached peak proportions. This great volatility is interrelated with and attributable to price differentials between U.S. cotton and that of other major exporting countries. Sustained expansion in 1955 was ham-

²³ OEEC, Sixth Report of the OEEC, *From Recovery Towards Economic Strength*, Volume I, p. 247.

²⁴ OEEC, *Foreign Trade Statistics*, Series IV, United States of America.

pered by both the impact of excess supplies and the inflexibility of U.S. prices in the face of falling world-market prices. Likewise, the closer alignment of U.S. prices with world prices imparted a vigorous impetus to trade, and OEEC purchases of cotton continued to expand throughout 1956 and 1957. A more surprising development has been the fact that all of the increase in member countries' imports of textile fibers since 1953 has come from the United States.

The rate of growth of raw-material imports during 1957 was unusually high (52 percent) — indeed higher than at any time during the preceding years. This was not unexpected. The blockage of the Suez Canal disrupted the prevailing pattern of commodity flows, necessitating a reorientation in import sources, particularly those involving fuels. Thus, raw-material imports from the United States were gathering momentum at a time when Western European demand forces were already strong of their own accord.

The import demand for raw materials from the United States did not share commensurately with that for foods and manufactures in the general recovery after the 1958 recession. Over the two years 1958 and 1959, imports of raw materials declined steadily by 60 percent, and it was not until 1960 that they started to rise again. But they are still considerably beneath the 1956-57 peaks. The fall in imports and subsequent hesitancy in revival can be traced to a number of factors among which the following were of crucial importance: (a) the scaling down of production and imports of coal,²⁵ mainly by the countries of the

European Coal and Steel Community, (b) disappearance of users' stocks of coal, steel, and cotton, and (c) the leveling off of total exports to the United States during 1958.

In addition to the existence of a considerable amount of excess capacity in production, the fall in coal imports in 1958 and in 1959 reflected the accelerated substitution of oil for coal derived mainly from Middle-East sources. But in large part, the substitution was due to the fact that the price ratio of coal to oil changed in favor of oil. On the other hand, the weakening of OEEC countries' imports of iron and steel products may be ascribed to an increase in domestic production, reducing thereby the dependence on external sources of supply. It appears that on an individual commodity basis, besides cotton, petroleum and coal suffered most from the recession in 1958.²⁶

Apart from the important consideration of stock liquidation and the contraction in textile industries, movements in cotton imports mainly reflected changes in the level of export subsidy (August, 1958) which raised U.S. prices above world-market prices. In the subsequent crop year, however, the scaling down of the export price rendered American cotton more competitive. This action contributed to a renewed growth of cotton imports by OEEC countries.²⁷ The textile boom and concomitant heavy stock-building also contributed to the marked shift in favor of American sources of supply.

Imports of raw materials, which had been 30 percent lower in 1959 than in 1958, surged sharply upward in 1960 by

trols, and export subsidies will presumably cast U. S. coal in the role of a marginal source of supply.

²⁶ See OEEC, *Foreign Trade Bulletins*, Series IV, United States of America.

²⁷ See United Nations, *Economic Bulletin for Europe*, Vol. 12, No. 2, p. 10.

²⁵ Under the plans at present being considered by the High Authority of the Community output of coal is expected to be reduced below the 240 million tons produced in 1959. This in combination with a number of import restrictive devices such as quotas, tariffs, price con-

exhibiting a gain of about 44 percent in value.²⁸ This remarkable gain was caused by (a) vigorous restocking of industrial raw materials, including cotton,²⁹ (b) continued high rate of increase in industrial output, particularly in the iron, steel, textile, paper, nonferrous metal, and chemical industries, and (c) comparative weakness of import prices of raw materials.

On the whole, there seems little doubt that Western European import demand for American raw materials is highly responsive to temporary and cyclical movements in aggregate demand. As in the past, American raw materials are expected to benefit in times of very rapidly expanding general economic activity when domestic supplies prove to be inadequate to meet demand or impede further growth. As a corollary, any pause or downturn in economic activity that may occur in years ahead will conceivably have far more serious repercussions on the demand for American raw materials than on internally produced ones. Moreover the trend in raw-material imports will depend also on future progress in the liberalization of trade from the dollar area and on the pursuit of policies facilitating an unfaltering pace of industrial expansion.

Intra-OEEC trade in manufactures. The slackening in general economic activity and concurrent fall in the food and raw-materials imports have had no unfavorable repercussions on intra-OEEC trade in manufactures. As data in Table 4 indicate, trade in manufactures after rising particularly fast since 1951, slowed

down in the course of 1958. However, it never ceased to grow; and by the end of 1959, trade in manufactures resumed a strong upward trend, extending at an accelerated pace into 1960.³⁰ It may well be that the lower volatility of manufactures in intra-OEEC trade is primarily due to differences in the timing and amplitude of changes in general economic activity of member countries. That is, a fall in over-all economic activity including imports in one group of countries has been more than compensated by renewed growth in another group.

The rapid advance in intra-OEEC trade since 1954 has been based on the continuance of a high degree of liberalization of imports. Between the beginning of 1954 and the close of 1955, the over-all percentage of liberalization of intra-OEEC imports rose from 77 percent to 86 percent. The expansion of intra-OEEC trade during 1959 reflected the phenomenal growth of French exports, particularly to Germany, as well as those of Benelux countries, Denmark, Italy, and the United Kingdom to other member countries.

The impetus to the revival of French foreign trade came from a coordination of expansionary policies, external as well as internal, instituted during the second half of 1958 and in 1959. These policies include (a) devaluation of the franc from 422 to 494 francs to the United States dollar (August, 1958), (b) reliberalization of trade by raising the degree of liberalization to 90 percent on intra-OEEC transactions and to 50 percent on dollar imports, (c) declaration of non-resident convertibility, and (d) anti-inflationary fiscal measures designed to eliminate the budget deficit, reduce consumption, and halt price increases.

²⁸ As against this expansion the corresponding increases of imports from primary-producing countries were only 14 percent. See OEEC, Statistical Bulletins, *General Statistics*; Foreign Trade, Series I and A; and national statistics for each of the countries.

²⁹ See OEEC, Statistical Bulletins, *General Statistics*, Part I, *Main Economic Indicators*, and national statistics.

³⁰ In large part, the generally favorable trend in trade in manufactures during the 1958 recession is attributable to the sustained demand for automobiles, chemicals, and consumer durables.

Manufactures imports from the United States. The most dynamic element in OEEC countries' imports from the United States has been manufactures. The value of these transactions rose from \$1,326 million in 1951, to \$3,665 million in 1960 or by 176 percent (Table 4). The effect of such vigorous expansion was an improvement in the U. S. export position in western Europe, raising her share from 12.7 to 14.2 percent of the total during the period considered.

The demand for United States-made manufactures other than capital goods appears to have been least affected by the post-Korean stagnation. Member countries' imports from the United States between 1951 and 1953 declined by less than \$160 million in value or by about 7 percent. The relative stability of these commodities is the more impressive because it occurred at a time when Western European industry had an excess of productive capacity and an under-employment of manpower. The major elements in this development have been the combination of a number of favorable circumstances including an improvement in terms of trade (1952-53) caused by a fall in import prices and an improved balance of payments (1952-53) resulting from the high level of U.S. aid and military receipts.

Compared with fuels and raw materials, imports of manufactures from the United States during the 1954-1957 period did not share fully in the expansion. The over-all rate of growth was about 77 percent and there appeared divergent tendencies in the rates of expansion among various commodity categories. In particular, imports of consumer goods had fared generally worse than any other group of manufactures. The comparative moderation of imports of finished

goods is in large measure attributable to the persistency of tariff and quota impediments designed to shield this sector from outside competition. Indeed, in the period under review several member countries not only failed to use existing quota facilities but in some cases even enlarged their scope.

The importance of manufactures in trade with the United States can be seen from the fact that in 1958 when general economic activity leveled off and imports of other commodity groups declined or stagnated, the fall was relatively slight, amounting to about 6 percent. The whole of the decline in imports in that year was, in fact, concentrated on machinery, aircraft, and textiles, while other commodity groups continued to rise.

Despite the leveling off in economic activity, the foreign-payments position of member countries improved during 1958. The principal factors in this development were (a) lower imports, especially from the United States, (b) simultaneous fall in import prices, and (c) reversal of short-term, primarily speculative, capital movements. At the same time exports to the United States were much better maintained than those destined to third countries. As a result, member countries resumed the movement towards freeing additional dollar trade, particularly on the part of the United Kingdom and Germany, from tariffs and quantitative restrictions. In 1959 the highest rate of increase was recorded by civilian aircraft, reflecting the wide adoption of jet planes by Western European airlines while various types of machinery and semi-manufactures such as iron and steel products also contributed significantly.

Import demand in 1960 was strengthened by (a) high and rising levels of private consumption and government

outlays, (b) resurgence of private fixed investment in manufacturing designed to enlarge capacity and improve productive efficiency, (c) demand pressures arising from exhaustion of idle resources of labor and capacity in particular, (d) relaxation of import restraints applied against U. S. manufactures, and (e) further improvement in balance-of-payments position caused by the influx of short-term capital. Due to interest-rate differentials or speculative considerations, the movement in short-term capital was more than enough to offset the drain on gold and foreign-exchange reserves brought on by the deterioration of trade balances. It is, of course, true that the interconnection between domestic economic growth and balance of payments is much stronger for the primary exporting countries than for the highly industrialized countries.

The growth of exports in general, and those to the United States in particular, not only helped to sustain the imports of manufactures, but, by improving the balance of payments, has enabled member countries to carry through far-reaching programs of economic stabilization. The general object of these programs was to bring domestic demand pressures under control without checking the growth of the economy. In this process imports of manufactures from the United States played an exceedingly important part.

Summary and Conclusions

Four principal factors appear to have conditioned the demand for imports from the United States during the 1951-1960 period. First, the unprecedented rise in aggregate demand and supply; second, national as well as regional aspirations towards self-sufficiency facilitated by internal and external protectionist policies; third, the balance-of-pay-

ments position of member countries; and, finally, various special factors, temporary and cyclical, not causally related to the level of economic activity, such as the dislocations arising from the Korean and Suez crises, fluctuations in indigenous supplies of agricultural commodities caused by weather conditions, American export subsidy policies, and food shipments authorized under PL 480. In light of the prevailing tendency toward Western European integration, it may be expected that member countries will intensify rather than lessen efforts aimed at regional self-sufficiency. Hence in terms of the commodity aggregates considered, several developments seem likely:

1. The demands for foods and for beverages and tobacco will at best, maintain their present shares, in the order of approximately 10 and 25 percent, respectively, in Western European imports.

2. The demand for oils and fats will level off and probably experience a high degree of volatility commensurate with supply conditions in the associated overseas countries of EEC or EFTA and the traditional export countries of the Far East.

3. The United States will continue to play the role of a marginal source of raw-material imports, and her share in the OEEC market may hover around the current 10-percent level.

4. Imports of manufactures are expected to benefit from the mounting pressure of demand superimposed on an industrial structure where capacity in most sectors is being stretched to its limits by existing production rates. In this context, further moderate gains of the order experienced in the past are in prospect.

The Relation of Cost and Farm Size on Western Illinois Livestock Farms¹

J. C. KOHOUT and J. C. HEADLEY

FARMING HAS EXPERIENCED declining earnings since the close of the Korean War. This decline in earnings has been due to a reduction in the prices of farm products and to an increase in the cost of farm inputs. The "price-cost" squeeze has been the driving force behind much interest among farmers, farm suppliers, bankers, and agricultural economists in the relation of farm costs and farm size.

A popular line of reasoning associated with the solution to the problem of low farm earnings due to the price-cost squeeze has been that farmers should increase the size of their units and thereby lower unit costs, which would in turn yield higher earnings. This line of thought has been generally accepted by farmers and others as the solution, and consequently there has been increased interest in knowledge leading to the determination of the optimum or lowest-unit-cost farm size.

There is another possible route to a solution of this problem. This is the reorganization of existing resources that farmers control. When this is done, the returns to the fixed resources are maximized and lower unit costs result. It is believed that certain farmers may find this method to be more effective in lowering costs and less demanding in terms of capital requirements than the alternative of adding more resources to the already inefficiently organized resources on the farm.

¹ A more detailed discussion of this is reported in J. C. Kohout, "A Study of Farm Cost-Size Relationships and Their Implications," unpublished Master's thesis, University of Illinois, 1962.

The study reported in this article attempted to do two things:

1. To find the relationships that exist between unit costs and farm size under actual farming situations.
2. To find the relationships between unit costs and farm size in a situation in which resources are used in optimum combinations.

The information on which the study was based was taken from Farm Bureau Farm Management Service records for 1960 in six counties in the western part of Illinois: Henry, Knox, McDonough, Mercer, Stark, and Warren (Fig. 1). These counties lie between the Missis-

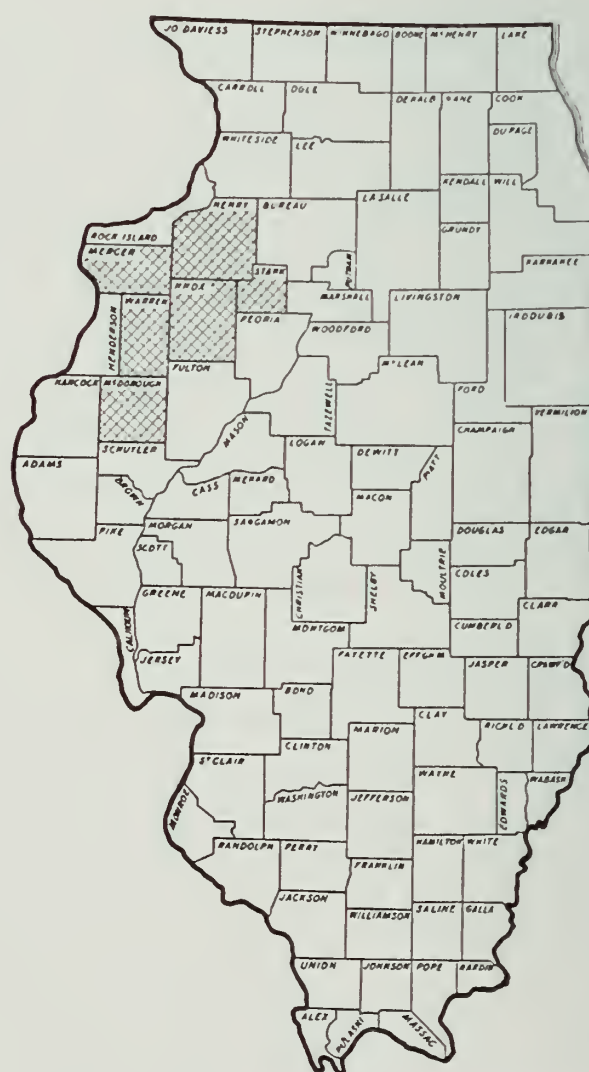


Fig. 1. — Location of area studied.

sippi and Illinois rivers with the center of the area approximately 200 miles southwest of Chicago and 50 miles west of Peoria. The 134 farms from which records were used were homogeneous units with respect to enterprises and soil productivity. They were assumed to be representative of the beef-hog farms of the area.

The farms were classified into five size groups as follows:

Farm size group	Range in acres	Av. tillable acres	Av. total acres
I (21 records)	120-199	150.0	165.0
II (40 records)	200-279	218.6	241.5
III (34 records)	280-359	276.2	314.5
IV (27 records)	360-519	367.9	431.5
V (12 records)	520 or more	545.0	673.4

Table 1. — Average Cost and Revenue Accounts of 134 Western Illinois Farms by Size Group^a

	Farm size I	Farm size II	Farm size III	Farm size IV	Farm size V
Acreage range	120-199	200-279	280-359	360-519	520 or more
Average acres	165.0	241.5	314.5	431.5	673.4
Cost					
Fixed costs					
Depreciation	\$ 2,228	\$ 3,359	\$ 3,429	\$ 4,639	\$ 7,842
Interest on capital	4,257	6,464	7,437	10,180	15,580
Unpaid labor	3,750	3,960	4,260	4,680	5,160
Subtotal	10,235	13,783	15,126	19,499	28,582
Variable costs					
Taxes	1,028	1,414	1,626	2,229	3,498
Electricity and telephone	180	219	234	284	419
Machinery repairs	957	1,264	1,355	1,746	3,043
Machinery hired ^b	303	356	291	235	202
Gas and oil ^c	603	859	1,118	1,176	1,801
Auto expenses	255	268	276	272	410
Fertilizer	346	839	1,218	1,114	3,804
Building repairs	329	526	676	505	526
Seed and crop expenses	482	795	975	1,191	2,308
Livestock expenses	445	622	732	542	1,106
Feed expenses ^d	2,974	4,995	4,872	4,949	7,405
Hired labor	240	1,110	1,830	2,460	4,830
Miscellaneous expenses	179	359	188	249	340
Livestock purchased	4,703	9,555	6,910	21,848	23,952
Subtotal	13,024	23,181	22,301	38,800	53,644
Total cost	\$23,259	\$36,964	\$37,427	\$58,299	\$82,226
Revenue					
Crop revenue					
Corn ^e	\$ 946	\$ 1,589	\$ 4,650	\$4,447	\$ 8,169
Soybeans	291	473	725	1,756	1,101
Oats	932	1,099	1,513	1,883	1,513
Wheat	32	...	45	100	...
Subtotal	2,201	3,161	6,933	8,186	10,783
Livestock revenue					
Beef cattle ^f	8,408	18,963	14,285	37,824	47,969
Hogs	9,877	14,543	15,863	13,103	14,565
Sheep	13	33	23	87	54
Poultry	18	38	10	13	11
Dairy cattle	9	...	19	6	17
Eggs	209	240	69	100	29
Milk	56	...	37	9	87
Subtotal	18,590	33,817	30,306	51,142	62,732
Total revenue	\$20,791	\$36,978	\$37,239	\$59,328	\$73,515
Total cost					
Total revenue	1.119	1.000	1.005	.983	1.118

^a From a sample of Farm Bureau Farm Management Service Records, 1960. ^b Minus custom work done. ^c Minus tax refund. ^d Includes minerals, proteins, and small grains. ^e Production minus corn fed times price. ^f Weight produced times price, plus livestock purchased.

Actual Farm Plans

A cost-account sheet for each size group was prepared and divided into two sections: fixed inputs, which included interest on capital (including land), depreciation, and unpaid labor, and variable inputs. This accounting is shown in Table 1 and represents averages of the farm records in each size group.

A revenue account sheet for each size group was prepared and divided into two sections, crops and livestock. The yields used to compute crop production were an average of the yields reported from all records in the sample. The prices used were a five-year average (1956 through 1960) of the area prices of crops and state averages for prices of livestock. The livestock production was taken from the records and averaged for each size group. These accounts are also shown in Table 1.

It was possible then from the cost and revenue accounts to compute the cost-revenue ratio for each farm size group. This gives the cost per dollar of revenue

and a measure of the efficiency of resource use that existed on each farm size. The cost-revenue ratios in Table 1 show that, as the sample farms were operated in 1960, farm size IV had the lowest cost per dollar of revenue of 98 cents. The ratios for the other sizes were above or close to one dollar indicating that farms of these sizes were, on the average, breaking even or losing money. It is interesting to note that the cost per dollar of revenue or the average cost was nearly identical for the smallest and the largest farm sizes (I and V).

If the cost-revenue ratios are interpreted as average unit costs, then these ratios can be used to form a long-run average cost or planning curve for farms in this area. Such a long-run average-cost curve is shown in Figure 2.

The long-run planning curve derived from the farm records is U-shaped. It is difficult to say whether the tendency to lower farm costs per unit of output as the farm size increases to an average of 431 acres is the result of economies

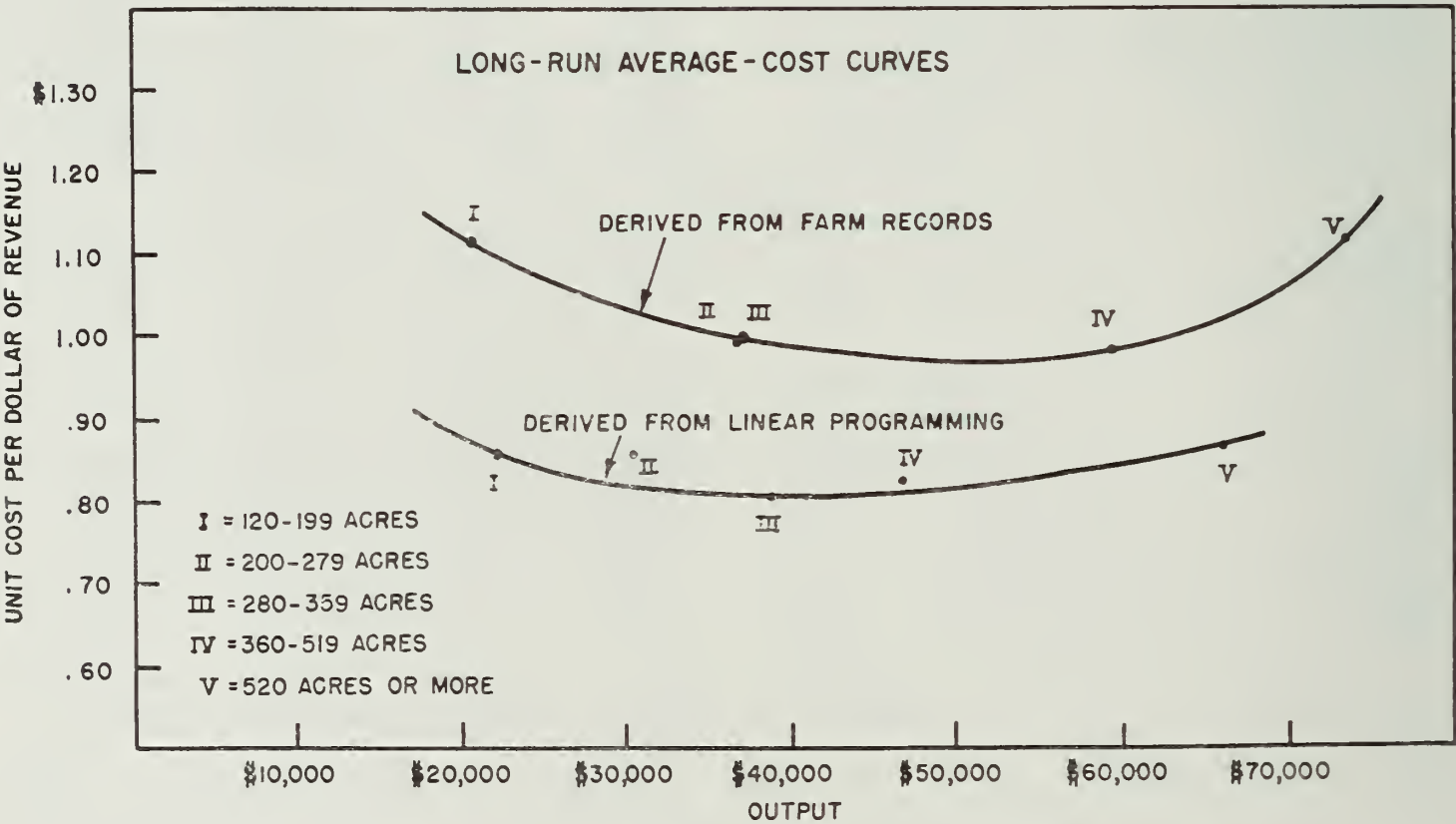


Fig. 2. — Relation of cost to output.

of scale or of size.² Certain inputs increased more than others as the acreage was increased. Therefore, the effects of scale are confounded with the effects of merely spreading overhead or fixed charges over more units of output. Labor was one cost in the accounting that showed a less than proportionate increase as acreage increased. Certain of the economies came about perhaps as a result of more fully utilizing the labor supply as the farm size became larger.

If the two types of costs — fixed and variable — are examined for the different farm sizes, it becomes evident that the variable costs or those costs associated directly with output increased in a more or less constant relation to acreage. This implies that large farms do not make any better use of fertilizer, seed, gasoline, etc., than do smaller farms. The fixed charges, or those not associated with output directly but rather with the size of plant, did not increase as much as land, percentagewise, for farm sizes I, II, and III, and therefore can be partially responsible for the decline in unit costs. Fixed charges in farm sizes IV and V were in a constant relation to acreage, using farm size III as a base.

Of course, revenue enters as the denominator of the cost-revenue ratio. The revenue as summarized in Table 1 shows that revenue from crops increased at approximately a constant rate as land increased, except for farm size III. Farms in this group tended to specialize more in cash-grain crops than farms in other groups, and therefore the revenue from crops was disproportionately high.

² Economists differentiate between economies of scale and economies of size. Economies of scale are the reductions in unit cost resulting from a proportional increase of all farm inputs. Economies of size are the reductions in unit costs resulting from a nonproportional increase in farm inputs. This phenomenon is sometimes referred to as "spreading overhead."

There seemed to be a tendency for revenue from beef to increase with farm size, while revenue from hogs tended to stabilize at a level of about \$13,000-\$15,000 beginning with farm size II. This could reflect an increasing amount of operating capital, which was available for the purchase of feeder cattle, or it could indicate a pressure on the labor supply and an attempt to obtain more intensive use of labor by using additional labor for feeder cattle.

Optimum Farm Plans

As a basis for evaluating the performance of the farms in the study area, linear programming was used to determine the optimum resource use on each farm, the product produced, the revenue from the product, and the cost of production. The use of this technique provided an estimate of the cost-size relationships when all resources on the farm were employed in such a manner that the return above operating capital (cash costs) was maximized. This meant that returns to the fixed factors were maximized. The intricacies of the programming technique are well reported in the literature and, therefore, will not be elaborated here.³

Five programming problems were solved — one for each farm size — and the results were summarized in a form identical to the farm record summaries to allow comparison. Prices used for the programmed solutions were the same as those used in the record summaries. Any divergence between the "actual" and the "programmed" solution could thus be

³ For a detailed discussion of the linear programming technique see for example: Dorfman, Robert et al., *Linear Programming and Economic Analysis*, McGraw-Hill Book Company, 1958; and Heady, Earl O., and Wilfred Candler, *Linear Programming Methods*, Ames, Iowa, Iowa State College Press, 1958.

Table 2. — Resource Restrictions for Linear Programming by Farm Size

Resource	Farm size I	Farm size II	Farm size III	Farm size IV	Farm size V
Land, tillable acres.....	150.0	218.6	276.2	367.9	545.0
Wheat land, acres.....	13.5	13.5	13.5	13.5	13.5
Winter labor, hours.....	698	887	1,066	1,249	1,748
Spring labor, hours.....	998	1,268	1,522	1,785	2,498
Summer labor, hours.....	798	1,014	1,218	1,428	1,998
Fall labor, hours.....	831	1,056	1,269	1,488	2,081
Operating capital, dollars.....	10,813	19,285	17,471	32,801	43,621
Permanent pasture, days.....	455	650	1,200	2,050	3,060

attributed to differences in resource use. Resource restrictions were derived from the farm records and are shown in Table 2. These restrictions provide the stock of resources available for each farm size. In other words, the optimum plan for each farm size could not use more resources than the amount available as indicated by the restrictions for that size group.

The major alternatives available to each farm were:

- 1. Feeder cattle (yearlings)
- 2. Hogs (sow and litter)
- 3. Corn
- 4. Soybeans
- 5. Wheat (13.5 acres, acreage permitted without allotment)
- 6. Oats
- 7. Rotation pasture

Resources available to the farm were then applied to those alternatives that provided the largest return until the supply of some or all resources was exhausted. At this point it is not possible to reorganize the farm unless: (1) more resources are purchased or (2) the returns to the fixed factors are reduced. The second alternative is undesirable from a returns standpoint and whether the first is to be utilized depends upon the cost of more resources and upon the expected return from use of more of a resource.

Comparison

Table 3 shows a summary and comparison of the actual or record analysis with the optimum or programmed analysis for each farm size. This is a comparison of what these farmers were actually doing in 1960 with what they could have done. A comparison of income from sale of crops and livestock, total revenue, costs, net revenue, and the cost-revenue ratio for each farm size is made.

The differences are interesting. Optimum resource use resulted in an increase in the amount of corn sold in every farm size group. The optimum farm plans of farm sizes I, II, and III included the maximum amount of wheat that can be grown without an allotment. Wheat did not appear in the optimum plans for farm sizes IV and V. Income from oats in farm sizes I, II, and III was reduced by shifting to optimum resource use, but oats were increased in the optimum plans of the two larger farm sizes compared with the actual records. Generally oats are not considered to be a profitable crop when produced as a cash crop in excess of nurse-crop requirements for legumes. However, on these larger farms, seasonal labor became restricting and oats made the best use of seasonal labor available, and the oats enterprise was therefore large in farm sizes IV and V. Soybeans,

Table 3. — Enterprise Combination by Farm Size: A Comparison of Actual and Optimum Farm Plans

	Farm size I		Farm size II		Farm size III		Farm size IV		Farm size V	
	Actual	Pro-grammed	Actual	Pro-grammed	Actual	Pro-grammed	Actual	Pro-grammed	Actual	Pro-grammed
Crops sold										
Corn.....	\$ 946	\$ 1,894	\$ 1,589	\$ 5,522	\$ 4,650	\$ 8,813	\$ 4,447	\$12,115	\$ 8,169	\$19,563
Wheat.....	32	614	...	614	45	614	100	...	...	...
Oats.....	932	91	1,099	195	1,513	189	1,883	2,032	1,513	3,534
Soybeans.....	291	...	473	...	725	...	1,756	...	1,101	...
Livestock										
Hogs.....	9,877	19,908	14,543	24,636	15,863	29,203	13,103	32,873	14,565	43,084
Beef cattle ^a	8,408	...	18,963	...	14,285	...	37,824	...	47,969	...
Miscellaneous.....	305	...	311	...	158	...	215	...	198	...
Total revenue.....	20,791	22,507	36,978	30,967	37,239	38,819	59,328	47,020	73,515	66,181
Cost										
Operating expense....	10,813	6,783	19,285	9,065	17,471	11,159	32,801	13,368	43,621	18,586
Other expenses, de- preciation, and interest.....	12,446	12,446	17,679	17,679	19,956	19,956	25,498	25,498	38,605	38,605
Total cost.....	23,259	19,229	36,964	26,744	37,427	31,115	58,299	38,866	82,226	57,191
Net revenue.....	\$ -2,468	\$ 3,278	\$ 14	\$ 4,223	\$ -188	\$ 7,704	\$ 1,029	\$ 8,154	\$ -8,711	\$ 8,990
Total cost	1.119	.854	1.000	.864	1.005	.802	.983	.826	1.118	.864
Total revenue										

^a Weight produced times price, plus livestock purchased.

which were not present in particularly large acreages on any of the farm sizes, as indicated by the records, were eliminated in the optimum farm plans. Soybeans were not as profitable as corn or wheat with the yields and prices used in the determination of these optimum plans.

Livestock enterprises were rearranged in the optimum plans as compared with the actual plans. Optimum resource use required an increase in the hog enterprise in each farm size. Feeder cattle did not appear in the optimum plans for any farm size. This phenomenon was primarily due to the use of a corn-hog ratio of \$1.11 to \$16.40 compared with a corn-beef ratio of \$1.11 to \$22.90. Therefore, the hog enterprise was more profitable and was used in preference to feeder cattle.

The only difference in expenditures between the optimum and actual plans occurred in the operating expenses. In all cases, the operating expenses of each farm size were reduced by optimum resource utilization. The exclusion of the feeder-cattle enterprises was the primary

cause of this reduction since the purchase of feeders was considered to be an operating expense. Fixed charges were not changed since, by definition, these are costs that are associated with durable capital investment (including land) and institutional patterns such as taxes, etc. Optimum use of resources for the five groups results in an increase in net revenue and a lowering of the cost-revenue ratio even though the total revenue was not increased in all cases, as shown in Table 3.

Figure 2 presents the cost-revenue ratios for the linear programming plans. This estimate of the long-run average-cost curve is below the actual situation and the low-cost farm size is now farm size III. Note that this amounts to a shifting of the cost curve down and to the left with optimum resource use. It should also be noted that optimum resource use resulted in a smaller difference in the cost-revenue ratios of the different farm sizes. That is to say, the cost advantages of a particular farm size are not as well defined as they were in the record analysis. This leads to the

conclusion that farmers can gain more cost advantage by reorganizing their farm business toward more optimum resource use than by attempting to acquire the resources necessary for the least-cost acreage size of farm.

Summary and Conclusions

This study of cost-size relationships in farming in western Illinois brought out several points.

First, the cost-revenue ratios for different farm sizes as operated in 1960 formed a conventional U-shaped curve. This indicated that farmers on certain size farms were, on the average, obtaining production at lower cost than farmers on smaller and larger acreages and that this least-cost farm size was about 431 acres.

Second, the differences in the cost-revenue ratios were partially explainable by differences in fixed investments, which do not vary with output and were not held in constant relation to farm size. This is consistent with the U-shape of the long-run cost curve estimated from the farm records. The size of fixed investment may be the result of inheritance, a hedge against weather and price uncertainty, an attempt to take advantage of income tax deductions through depreciation on machinery, a lack of information as to the optimum combination of factors, or personal values which include varying degrees of profit maximization. These are perhaps only a few of the factors involved.

Third, optimum farm plans as derived from linear programming showed that the reorganization of each farm size resulted in increased net revenue and therefore a lower cost-revenue ratio. These optimum plans revealed a tendency to specialize in hogs as a livestock enterprise as opposed to the hog-feeder cattle combinations on the actual farms. It should be pointed out that the divergence between the actual and the optimum in this case does not necessarily imply irrationality on the part of farmers. The necessary condition for the optimum plans is that the prices, costs, and yields that were assumed do in fact prevail. Operating farmers do not know these quantities with certainty and therefore must be guided by their expectations. Farmer expectations could result in a completely different set of prices, costs, and yields and therefore a different farm plan. However, these optimum plans do show a means of estimating what would happen if the assumed conditions did prevail. This is a modest addition to the knowledge of the farm operator.

Fourth, the comparison of the actual and optimum cost-revenue ratios for the farm sizes shows that optimum resource use results in considerably lower costs and costs that are more nearly equal for each farm size. This, it was suggested, indicates the value of farm planning as a means of increasing earnings that may be more fruitful than attempts to increase the acreage size of the farm and accompanying fixed investments.

The Danish Farm System

FOLKE DOVRING and HANS K. LARSEN

THE SUCCESS STORY OF DANISH agriculture is widely known, and much has been written about the forces that brought it about — forces which are more human and spiritual than they are economic in the narrow sense. It is perhaps less generally understood on what economic principles this success rests.

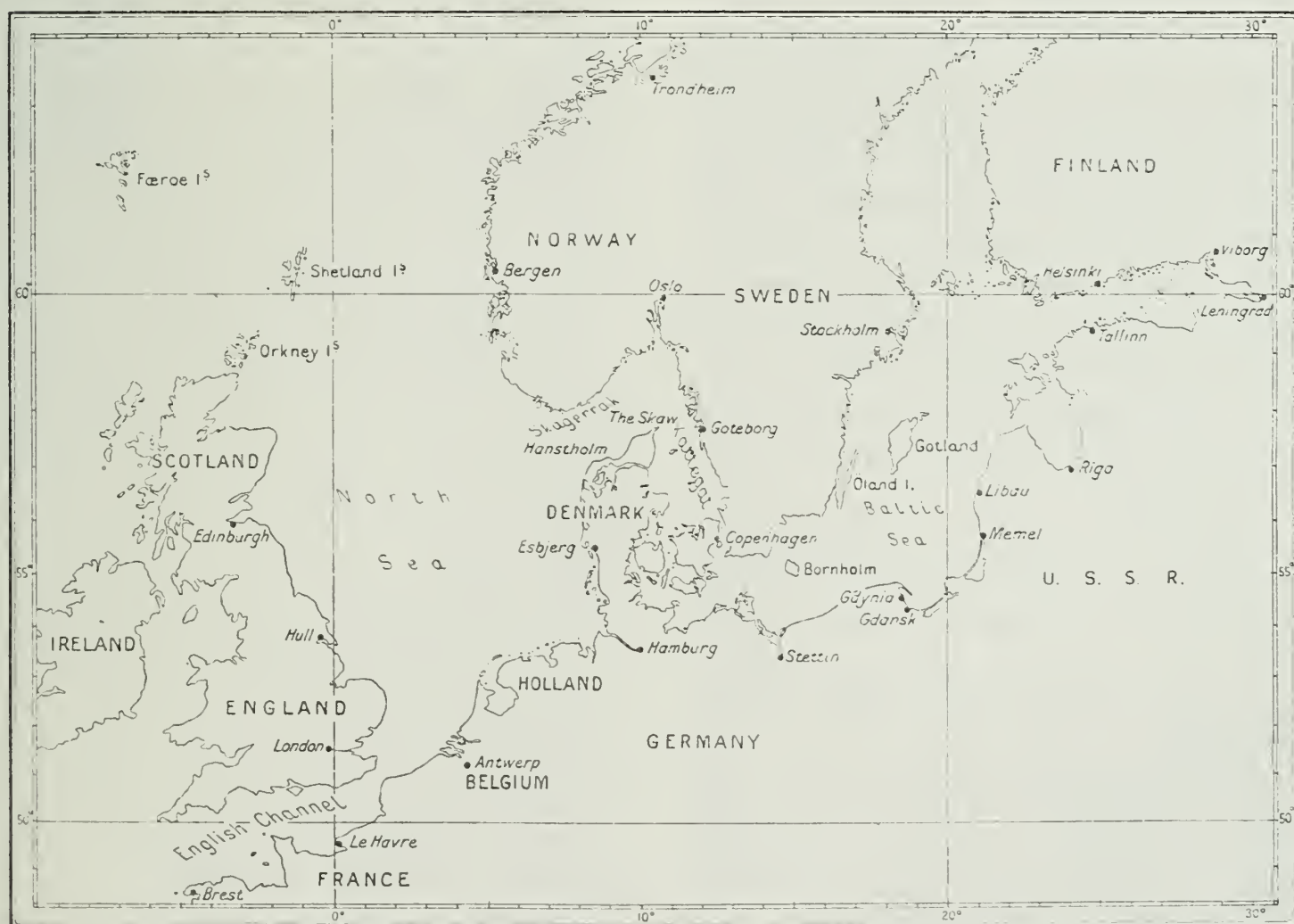
Some General Features

Denmark lies in the cool-temperate zone, more to the north than any part of continental United States — rather on a level with southern Alaska. The Gulf Stream makes for a mild maritime climate. The length of the growing season is about the same as in Illinois. Summer days are longer but cooler. Corn will not ripen, but small grains, root crops, and some oilseeds do well, and meadows

and leys continue to be productive throughout summer and early fall.

The landscape is flat to gently rolling. Soils are mostly glacial or alluvial, some good, some poor. The average inherent fertility is not particularly high, but the cool-temperate, humid climate permits a systematic build-up of structure and organic matter through intensive cultivation and heavy fertilization.

The area of Denmark is less than one-third that of Illinois. The percentage of land in farms is slightly lower, and total farm land therefore is about one-fourth of that in Illinois. The intensity of land use is higher, and total gross output of agriculture slightly over one-half of that in Illinois. The number of farms and the number of people working in farming are somewhat larger in Denmark



than in Illinois. The number of acres per man is thus less than one-fourth and gross output per man about one-half of those in Illinois.

In terms of net value product the difference is smaller because of differences in cost structure.¹ Net value product per man in Danish agriculture is about three-fourths to four-fifths as large as in U. S. agriculture. Comparison of productivity and income in dollar terms across the frontiers exaggerates differences.² A dollar's worth of currency will buy more goods and services in Denmark than in the United States. In real terms, the income of Danish farmers is on a level with that of U. S. farmers and not very far behind that of Illinois farmers. For efficient resource use within a country, the relation of farm income to non-farm income is important. In contrast to the United States, there is no income parity problem in Denmark. Danish farm people enjoy very nearly the same income level as city people.

Most Danish farmers own their farms (96 percent). Tenants (4 percent) are found in all size groups of farms but more often on large than on small farms. It has been relatively easier to become an owner than to become a tenant; long-term loans covering up to 75 percent of the property value can be obtained for farm purchase through credit associations, while tenants may encounter some difficulty in finding short-term credit for farm operation.

The farm labor force consists mainly of the farm operators and their family members. Farmers' sons often take jobs

on other farms for apprenticeship. Together with instruction in agricultural schools this system provides good training for future farm operators. An outsider may think that there is a large class of landless hired farmhands. The latter are few and mostly employed on larger farms; as these farms have achieved a high degree of mechanization in the post-war period, the number of regular farm hands has decreased considerably.

Danish farming has reached a fairly advanced stage of mechanization. However, it is not always economical to mechanize all of the work processes on general farms because a large number of different implements would be required. Further, at the present level of mechanization the processes provide full employment for the family labor all during the year.

How the Farm System Was Created

Two-hundred years ago Denmark had a rather ineffective version of the European estate system. A small number of families, largely of the old nobility, owned most of the land, which they used through dependent tenants. This kind of farming resulted in low production. At that time the population had not increased since the Middle Ages.

A radical breach with this system and far-reaching social changes came with the tenancy reforms in the decades around 1800. Dependent tenants were emancipated and given lifetime tenure of their holdings. Voluntary purchase and sale eventually turned most of the farmers into owner-operators, in part by aid of favorable land-credit systems. The old villages with their scattered strips of land were broken up, and the farms consolidated into coherent tracts of land.

This movement of agrarian reform had its roots in the same thought which inspired the revolutions in France and

¹ Net value product is gross value of output minus value of inputs originating outside of agriculture.

² Illinois Farmers' Outlook Letter "Has Denmark Saved or Destroyed the Family Farm?" December 20, 1961, by L. H. Simerl implies this type of comparison. It is misleading on this and other points and its conclusions are therefore not valid.

America, and which in the United States found expression in the Constitution and the Homestead Act. In Denmark the more far-sighted among the landowning nobility helped the absolute monarchy to abolish age-old privileges and lay the foundations of democracy by royal decree.

The tenancy reforms took place while the country was still thinly settled, and the peasant farms became larger than in most countries in Europe. The core of the Danish farming system today is some 90,000 middle-sized farms, ranging from 25 to 150 acres, and averaging about 75. These farms include over two-thirds of the country's farmland. They came into being mainly through the tenancy reform but, in part, through land-clearance projects and to some extent through the recent small-holding development.

After the tenancy reform, in addition to the large estates another category was largely left outside the farm system: the cottagers. These were farm workers who might hold a few acres for their subsistence or no land at all. Relative prosperity of farming in Denmark in the decades immediately after the tenancy reforms allowed this class to grow more numerous. At the middle of the nineteenth century, Danish farming was still mainly grain farming. Grains were exported on a large scale, mainly to England. In this grain economy, the land holdings of the cottagers were not regarded as an active element in the system.

The inflow of low-priced grains from America, starting on a large scale in the 1870's, caused a severe crisis in agriculture in many countries in Europe. Denmark was hit hardest of all, being a large-scale grain exporter. The crisis was met vigorously, and the entire farm industry in Denmark gradually switched toward its present pattern of production.

Danish farming has in the last hundred years grown into a highly intensive industry. The objective is to produce high-quality products with a high degree of brand standardization and to market these at competitive prices. Animal production is based mainly on feed produced within the country (mostly roughages) supplemented by a moderate amount of imported feed grains and concentrates. In recent years the value of imported feed has amounted to about one-tenth of the value of home-grown feed. Quality of products is safeguarded through an elaborate control system at the grading and packing stages, as well as through scientifically based breeding, feeding, and processing methods. Even at the farm level a high degree of accuracy is a standing requirement in day-to-day work, to insure the necessary quality of the goods delivered to processing plants. Export specialties include "Lur Brand" meat and dairy products, seeds of high-yielding strains, outstanding pedigreed animals, and so forth.

In this labor-intensive system of farming, the cottagers got a chance to prove themselves and became a more and more active element in the industry and in the cooperative movement, which got its start during the late 19th-century crisis. This new situation is the background to the small-holding legislation which began just before the turn of the century.

The purpose of this legislation was to improve the economic situation of cottagers by establishing or enlarging small holdings. The size envisaged as sufficient for a reasonable income was gradually revised upwards. The land was obtained in part from state and church land and in part by purchase in the open market. Entailed estates were transferred to free property; for the privilege of such transfer, the owners were required to sell a certain fraction

of the land. The public powers have made some use of pre-emption (not applicable to family sales) but not of expropriation.

At the time when the small-holding policy was first adopted, there was not much manufacturing industry in Denmark and small chance that urban industries would readily absorb all of the underemployed people in agriculture. The situation has changed radically in recent decades, and there is no longer any need for expanding employment in agriculture. Thus the basis for the small-holder part of the land tenure legislation has been removed. This has also been recognized by most of the groups concerned, and now there is not much activity in pursuance of this legislation. More up-to-date laws are expected to be passed in the near future.

This policy has affected a large part of the now existing small holdings which number around 80,000, average about 15 acres of land and include about one-sixth of the farm land of Denmark. An even smaller share is in a few thousand large holdings representing what is left of the old estates.

Main Lines of Policy

Apart from the tenancy reform and the small-holding legislation, agricultural policy in Denmark has mainly aimed at enabling the industry to remain competitive in both the domestic and world markets. Further, the measures to enlarge small farms are as far as possible left to the initiative of the individual and the assistance of the farmers' organizations rather than to government.

There are several reasons for the absence of a comprehensive government farm program. Mainly it is due to the existence of the agricultural associations and cooperatives.

A characteristic of the entire system

of Danish agricultural organizations is that they are private institutions founded by farmers and governed by democratic procedures. The system was evolved gradually as the need for additional lines of activity appeared due to rapidly changing conditions. It reflects the determination of the farmers to have a firm hand in their own affairs at home and abroad. It also corresponds with their need to improve productive efficiency, to meet increased competition, and to secure to themselves as large a share as possible of the consumers' expenditures for farm products. Experience with this system shows that farmers can successfully play the role of decision-makers and entrepreneurs above the farm level.

Today the system is engaged in any number of activities such as importing, production and distribution of farm supplies, processing, and marketing of products at home and abroad. Some organizations participate in financing and insurance, others in large-scale advertising and exhibitions all over the world. Export boards have created price-stabilization funds, and through the processing units some measures of supply control have been adopted. At the export level, cooperative firms and private corporations work together in close understanding.

Connected with the agricultural societies is the extension service which has a large staff of agricultural specialists who run local experiment stations, give advice to farmers, etc. The expenses are in part covered by state funds, but the extension service operates as a number of independent institutions.

Denmark was one of the first countries to have compulsory primary school for all children. This began centuries ago and made Denmark one of the first countries with no illiteracy problem. It

was followed up by a system of schools for vocational training in the early part of the 19th century. These institutions receive subsidies from the state also but remain independent entities. Higher education — which is available for all academically qualified persons at very low tuition — is organized in a system of state institutions.

The outstanding feature of public policy is the almost complete absence of price supports and subsidies. This is logical in a country that exports two-thirds of its farm output. It simply is not feasible to subsidize a major export industry that is one of the keystones of the economy. According to recent FAO statistics, government support to Danish agriculture amounts to less than 1 percent of the total value of agricultural production in the country.³ Most of this amount is spent on research and education. Domestic prices are kept in line with those received on export markets. The achievement of Danish farms must be seen against this background.

Achievement in Recent Decades

A second serious setback was suffered in the 1930's, when the impact of the world crisis was compounded by increased competition with animal products from overseas — Australia, New Zealand, and Argentina — shipped with the new refrigeration techniques. Danish farming responded to these challenges by reducing costs through mechanization and by less use of hired labor, an accelerating rate of drop-out among under-sized small holdings, and continuing to emphasize quality of products. These responses became increasingly feasible as prosperity rose both in Denmark and among its main customers in Europe.

³ This compares with 10 percent for the U. S. See *Agricultural Policies in Europe and North America*, OEEC, Paris, July, 1957, p. 445.

The resulting rate of growth in productivity can be measured in various ways. The relation of farm labor to gross output is shown below:

	Labor used in farming	Agricultural production (1955 = 100)	Gross output per man (production divided by labor)
1935-1939.....	142	82	58
1950-1952.....	108	91	84
1957-1959.....	92	108	117

(Computed from data in Statistical Yearbook (Denmark), 1959 and 1960, and from *Statistiske Meddelelser: Agriculture*.)

Other data show that net productivity, measured as net value product, has developed at a similar pace:

	Labor used in farming, average fully employed man units (rounded)	Net value product in kroner at 1929 prices	Net value product per worker, kroner (rounded)
1921-1929..	500,000	922,000,000	1,850
1930-1939..	490,000	1,243,000,000	2,535
1951-1955..	370,000	1,460,000,000	3,950
1956-1959..	325,000	1,631,000,000	5,000

(From Statistical Yearbook (Denmark), 1959 and 1960, and from *Statistiske Meddelelser: Agriculture*.)

The doubling of net value product per man since the 1930's compares not unfavorably with the same development in the United States, where net factor productivity has doubled since 1930.⁴

In the postwar period, this growth in productivity has been hastened by the combination of continued growth in output and an accelerating decline in the agricultural labor force. From a half million man-equivalent units around 1930, labor used in agriculture is now estimated to be about 275,000 such units. In recent years it has been going down at a rate of more than 3 percent per year.

⁴ See J. W. Kendrick, *Productivity Trends in the United States, A Study by the National Bureau of Economic Research*, Princeton, 1961, pp. 343sq.

How those engaged in farming have fared under these changes depends, of course, on the development of current prices. Because of changes in the purchasing power of the currency, farm incomes in current prices can best be studied in their relation to other incomes in the same country.

It turns out that farm incomes have risen faster than other incomes in the postwar period. Throughout the period 1870-1940, net value product per man in agriculture (in current prices) was about 60 to 70 percent of net value product per man in other industries. There was thus some disparity, even though not as wide as in the United States. In the 1950's, however, this disparity almost disappeared. The near-parity position of Danish farm people is thus a recent achievement. It has not even been seriously threatened by the price slumps on international markets in the late 1950's.

This price movement caused much debate in the country. Some recent policies aim at stabilizing the prices without abandoning the basic adherence to world market prices and without any important departure from the low support level. A grain regulation act passed in 1958 is designed to protect Danish grain producers against dumping and at introducing some measure of supply control on bacon production. Another change regards milk products. Until recently, the retail price of certain dairy products in urban areas was determined by a base price agreed upon between producers and governmental and municipal authorities. The price followed the world market price although at a lower level, and could fluctuate without limits. Since June, 1961, this system has been supplemented by a minimum price to be applied when the base price would drop below a certain level. Since 1958, moreover, cer-

tain levies are imposed on sales of agricultural products at home and abroad to serve as funds for sales-promotion activities by the agricultural marketing boards.

The Size of Farms

During much of the past, Danish farming has worked against the apparent odds of declining farm size. The small-holding policy led to slowly declining average size of farms from 1900 to 1950. Since then the trend has been reversed, and farms are now 5 percent fewer than a decade ago, according to official figures. This, however, understates the trend towards farm enlargement. The need for larger units in the future is recognized, and laws that aimed at preventing amalgamation (as well as fragmentation) of farms are now being circumvented more and more openly, in expectation of legislation that will formalize a policy change which has taken place *de facto*. It is symptomatic that the land market in Denmark is quite active. Annual turnover of farm properties in open-market sales is relatively larger than in Illinois.

Danish farms may appear small when compared with American farms, and the farm enlargement movement is of later date and less advanced than here. In what way may we explain this apparent contrast between the trend in farm size and the trend in economic achievement?

In comparing farms of different size, it becomes evident that any difference in their efficiency is smaller than one would expect from the differences in their size. It can even be called in question whether there are any "returns to scale" above 25 acres in size. If net value product is computed per man working in the industry (i.e., including hired workers at the same rate as farmers) rather than per farm, then there appears to be very little

Table 1. — Output, Costs, and Income for Account-Keeping Farms in Jutland, 1955-56 (Farms Classified by Rate Earned on Capital)

	Rate of interest earned on capital		
	Lower third	Middle third	Upper third
Number of farms in sample	2,075	2,071	2,072
Average size, acres	87.4	93.4	92.1
Gross output, kroner per acre	783	877	987
Costs, kroner per acre ^a	760	785	816
Rate of interest on invested capital, percent	1.3	5.4	10.2
Family labor income ^b kroner per acre	75	136	203
kroner per family	6,585	12,645	18,673

^a Includes charge for labor, management, cash expenses, and depreciation on capital.
^b Interest on capital is held constant at 5 percent.
Source: Jydske Landboforenings regnskaber 1955-56, quoted from *Lomme-Håndbog for konsulenter og landbrugslærere*, Vol. 3, part 16. Hectares converted to acres.

difference in efficiency of different sizes of farms over 25 acres. As far as this remains true, society has no particular reason to want farms to become larger, if this would mean more use of hired labor.

How secondary the differences by size are can be illustrated by the data from

account-keeping farms in Jutland (Table 1). These farms of varying size have been classified into three groups according to the rate of interest on capital provided by income remaining after costs have been deducted. Note that the average size of farm is virtually the same for all groups — about 90 acres.

Other data from account-keeping farms over and under 20 hectares (49.4 acres) indicate nearly the same spread between higher and lower efficiencies among the smaller and larger farms although the latter are more than three times as large as the former (Table 2). These farms are classified within farm size groups by the rate of interest that residual income earned on capital.

Two lessons come out of these data. First, there is much more variation between farms of the same size than there is between sizes. It has been shown that economic success in this labor-intensive, quality-producing type of farming is rather closely linked to the level of education of the farmer. In any size group, farm operators with higher education are the more successful.

The high degree to which farm-to-farm variation depends on personal skill can be extended to the whole Danish

Table 2. — Output, Costs, and Income for Account-Keeping Farms in Jutland, 1955-56 (Farms Classified by Rate Earned on Capital Within Two Size Classes)

	Farms under 20 hectares (49.4 acres)					Farms over 20 hectares (49.4 acres)				
	Rate of interest at					Rate of interest at				
	Under 0%	0.1-5%	5.1-10%	Over 10%	All farms	Under 0%	0.1-5%	5.1-10%	Over 10%	All farms
Number of farms in sample . .	39	81	68	46	234	8	59	43	26	136
Size, acres	23.9	26.7	26.4	28.2	25.9	95.3	83.5	79.5	80.5	81.8
Land value, kroner per acre . .	359	351	363	338	352	331	427	427	409	418
Invested capital, kroner per acre	1,714	1,637	1,664	1,547	1,669	1,003	1,253	1,389	1,314	1,293
Gross output, kroner per acre	947	936	1,134	1,250	1,070	391	629	743	917	706
Net output (residual income) kroner per acre ^a	-60	47	123	208	79	-17	38	107	193	86
Average rate of interest, percent	-3.5	2.8	7.4	13.4	4.8	-1.7	3.0	7.7	14.7	6.6

^a Gross output minus charges for labor, management, cash expenses, and depreciation on capital.
Source: Jydske Husmandsforenings regnskaber 1955-56, quoted from *Lomme-Håndbog for konsulenter og landbrugslærere*, Vol. 3, part 16. Hectares converted to acres.

farm industry. The advanced level of general education as well as of technical training among Danish farmers and small holders means a highly qualified labor force available in quantity. The wide diffusion of entrepreneurial opportunity among these people, which is a consequence of the farm system, has by no means diminished their ability to produce income for themselves and their nation.

The second lesson is that the farms with the highest rate of net returns are also those with the highest inputs and gross returns per acre. The most intensive and high-yielding farms are the most successful ones, independently of size. This is the same principle as when we say that a high-yielding acre produces each bushel of corn cheaper than a low-yielding one, which is true in Illinois and elsewhere in the United States. Intensive land use is more profitable than extensive land use, because fixed costs are spread over more units of output.

This goes a long way to explain what has happened to Danish farming. Gross output was tripled from 1870 to 1930, while the farm population remained constant and farm numbers increased moderately. In terms of business rather than acres, farms grew larger and not smaller in this period.

The same principle also explains the strength of small holdings in Denmark. The smaller farms have a higher intensity in the pattern of their land use than the larger ones. They also have higher aggregate crop production per acre and higher conversion efficiency of feed fed to animals. In terms of business rather than acres, the differences in farm size are smaller than would appear from data on acre size alone.

This was especially important as long as agriculture had a surplus of manpower which could not be readily ab-

sorbed in other industries. In such a situation, the labor of the cottagers had a low opportunity cost. Their endeavor as small farmers was therefore their best chance until a short time ago.

Outlook for Danish Farms

The near-parity income position achieved by Danish farmers makes the size-of-farm problem not too urgent. It is recognized that the smallest holdings are no longer sufficient to yield a satisfactory income. They are disappearing at a fast rate. Gradually, as per capita income in the country goes up, the minimum size has to be raised, which is recognized in the present policy discussion.

The main reason why farms have to become larger at all in Denmark is that the export markets cannot be expanded indefinitely. (If they could, farms might as in the past grow larger by increasing their level of intensity.) Joining the Common Market may at the outset bring gains, but eventually it is safer to reckon with a farm production that does not expand much above its present level. To retain their income parity position, the number of people in agriculture will need to decrease at a rate that matches the continued growth of per capita income in the country as a whole. In other words, the Danish farm industry may be entering the same position of a (relatively) shrinking industry, that the United States farm industry has held for some time.

The Danish economy is now able to take care of such a situation. Farming has been the basis of a growing economy long enough. The rest of the economy has expanded vigorously, and farming is now a smaller sector than ever before (between 15 and 20 percent). Further over-all growth need not rely on the farm sector as much as in the past.

Some General Conclusions

The experience of the Danish farm system brings to mind some more general reflections which have wide application to the modern economic scene.

One is that the fate of agriculture to be a shrinking industry can be mitigated by relying on high-quality production. Markets can be built up and retained by farmers who maintain a qualitative edge on their competitors. Danish meat and dairy production bring this out in a way that needs no elaboration.

Another is in the relation of processing to raw materials. Denmark has very few resources other than its land. Fuel, metals, and many other raw materials have to be imported. Despite this, Denmark is now an industrial country with a level of per capita national income among the highest in Europe. Factories producing for export range from shipyards to chinaware and furniture. This can be done for a very simple reason: the processing of materials into more and more valuable products has to pay its own way; it cannot parasitize on the raw material industries. Distance is therefore the only real disadvantage of resource-poor countries and that too can be modified in many ways.

The Danish economy is thus above all a processing plant whose domestic input is a skilled labor force. This extends to the farm sector as well. The land base is supplemented by imported feedstuffs, and apart from this it is clear that the value product of Danish farming originates mainly from the way resources are handled.

On this point any country could benefit from an analysis of the Danish experience. It has been customary to classify an economy as (mainly) "resource-oriented" or "product-oriented." Whichever was the case to begin with, all economies that go toward higher per

capita incomes will become more product-oriented and less resource-oriented. This is a simple corollary of the very concept of economic development. The consequences can most easily be grasped by studying a definitely product-oriented economy as successful as that of Denmark.

Still another point is the importance of the human factor in production. In Denmark political and economic democracy has removed most class limits in society; this is connected with a high and even level of general education. The viability of small and medium-sized farms in a highly competitive economy rests, of course, on this foundation. The fact that the personal quality of operators counts for more than size of farm is clearly brought out in the Danish experience. It has embarrassed Marxian theorists in communist countries who have been unable to explain away the success of small-scale individual production in Danish agriculture. (Incidentally, also the lighter branches of manufactures in Denmark are to a great extent in many small firms.) The Danish farm system should be a warning to anyone else who emphasizes "returns to scale," to take a second hard look at his data and make clear whose returns he is talking about. The facts of Danish farming point in the direction that improved education can bring higher returns than any other investment, including those that increase the scale of operation.

"Education" must be taken in a wide sense, though. Technical know-how is not all that is required. Attitudes of self-respect and a sense for quality are rooted in a whole system of culture and cannot be thought of separately from it. Denmark has no monopoly on any of these things; it only presents an unusually clear and instructive case.

Adjustments in Size of Beef and Hog Enterprises: a Markov Process Analysis

G. G. JUDGE and E. R. SWANSON

LIVESTOCK PRODUCERS ARE constantly evaluating their businesses in terms of possible changes in size and nature of enterprise. They adjust their livestock operations in response to anticipated changes in prices, technology, and government programs, as well as other factors. Since World War II such adjustments have been represented by an increase in the average size of enterprise and an apparent trend toward specialization.

In this report we examine the structure of change in the beef and hog enterprises on selected farms in three areas of Illinois. The focus of the analysis is the dynamic process of adjustment by the individual producers.¹

Areas studied. Data were analyzed from producers in three two-county areas in Illinois, Bureau and Lee, McDonough and Warren, and Champaign and Piatt (Fig. 1). Although livestock farming is important in both the Bureau and Lee county area and the McDonough and Warren county area, there are some differences (Table 1). Cash-grain farms are relatively more important and livestock farms less important in Bureau and

Lee counties than in McDonough and Warren. Champaign and Piatt counties provide a strong contrast to each of the other areas by having nearly 80 percent of the farms classified as cash grain.

Census data showing the general trend of beef and hog production in each of

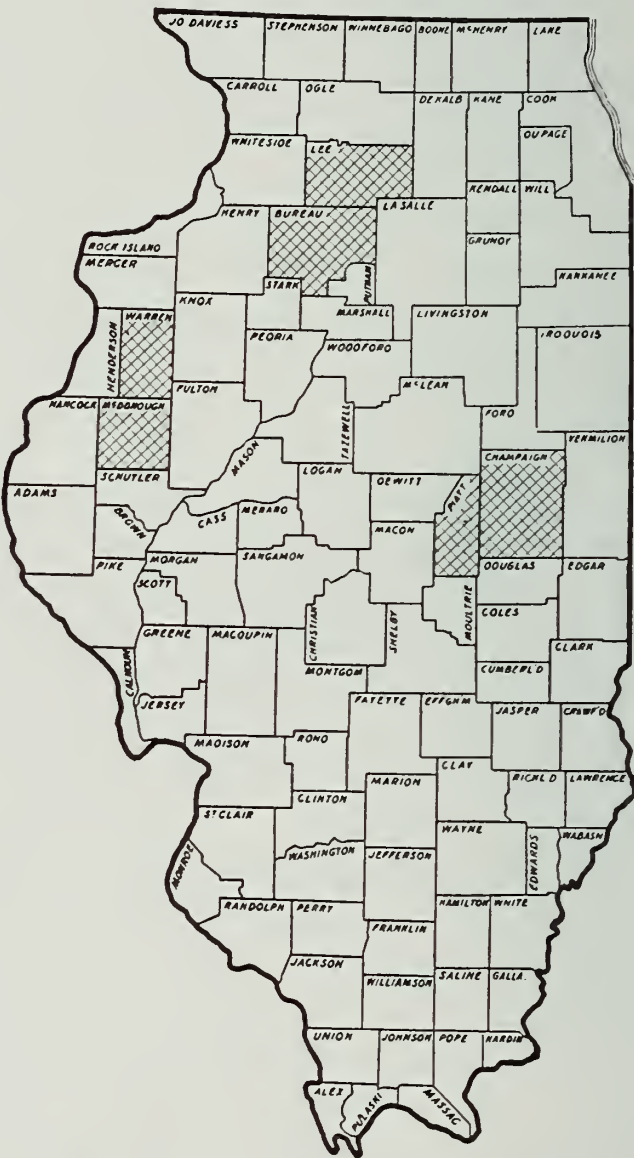


Fig. 1. — Location of areas studied.

Table 1. — Types of Farms in Selected Areas in Illinois 1959^a

Counties	Cash grain		Dairy		Livestock		General		Other		Total	
	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent
Bureau and Lee	1,452	31.6	310	6.7	2,130	46.4	255	5.5	448	9.8	4,595	100.0
McDonough and Warren . .	765	24.3	45	1.4	1,855	59.0	75	2.4	405	12.9	3,145	100.0
Champaign and Piatt . . .	2,866	78.2	65	1.8	325	8.9	90	2.5	317	8.6	3,663	100.0

^a U. S. Census of Agriculture, 1959, Vol. 1, Part 12.

Table 2. — Livestock Sold Alive 1944 and 1959^a

Counties	Cattle and calves				Hogs and pigs			
	Farms reporting sales		Animals sold per farm reporting		Farms reporting sales		Animals sold per farm reporting	
	1944	1959	1944	1959	1944	1959	1944	1959
Bureau and Lee	4,354	3,543	16	41	4,242	3,154	75	165
McDonough and Warren . . .	3,242	2,480	19	42	3,495	2,590	101	202
Champaign and Piatt	3,425	2,175	10	19	3,296	1,379	42	77

^a U. S. Census of Agriculture, 1945, Vol. I, Part 5; and U. S. Census of Agriculture, 1959, Vol. I, Part 12.

these areas are presented in Table 2. The percentage drop from 1944 to 1959 in number of farms reporting sales of cattle and calves is twice as great in Champaign and Piatt counties as in Bureau and Lee, the drop in McDonough and Warren being intermediate between these two areas. All areas had a substantial increase in the average number of animals sold per farm. The total number sold doubled in Bureau and Lee counties and increased markedly in McDonough and Warren counties; the increase in Champaign and Piatt counties was lowest at about 20 percent.

In hog production the relative changes among areas have been about the same as in cattle production (Table 2). The percentage drop in number of farms reporting has been greatest in the cash-grain area of Champaign and Piatt counties. Again the increase in total number of animals sold was greatest in Bureau and Lee counties, while the number sold in Champaign and Piatt counties actually decreased by about 25 percent.

Although these comparisons do not take into account the cyclical changes in beef and hog numbers, they do show the general form of the changes occurring and their lack of uniformity among areas.

Sources of data. In order to analyze the structure of year-to-year changes in beef and hog production in more detail, we used records kept by cooperators in

the Farm Bureau Farm Management Service in each of the three areas. The average lengths of time that cooperating farmers kept records during this 14-year period were as follows: Bureau and Lee counties, 7.3 years; McDonough and Warren counties, 7.5 years; and Champaign and Piatt counties, 7.4 years. In general, the cooperators' farms have more resources than average farms in their respective areas.

In the type of analysis employed, focus is placed on a producer's movement from a specific size of enterprise in one year to a specific size (perhaps the same) in the following year. Records from the period 1946 through 1959 were used. In Bureau and Lee counties there were 2,078 observations of "movements" of individual producers from one year to the next. In McDonough and Warren counties there were 1,096 such observations, and in Champaign and Piatt counties, 1,597 observations.

Changes in Size of Beef-Feeder Enterprise

The relative frequency of these year-to-year movements is the basis for the transition matrix in Table 3. The numbers in the cells of the transition matrix give the probability of movement from each of the size groups indicated in the left-hand column to each of the size groups indicated for the other columns.

For example, according to the experience of the producers keeping records in Bureau and Lee counties, the probability that a farmer with no beef feeders in a given year will remain out of the beef enterprise in the following year is 0.844, or about eight chances out of ten. The probability that he will go to an operation of over 200 cattle is very remote, 0.003.

Note that each row in Table 3 adds to 1.000. Note also that the figures on the diagonal running from the upper left-hand cell of a section (0.844 for Bureau and Lee counties) to the lower right hand (0.873 for Bureau and Lee) indicate the probability of no change in size of enterprise. The higher the figure, the greater the stability in the structure of beef feeding. Except for the feeders

with 1-15 or 16-30 head, it was more probable that a feeder in Bureau and Lee counties would stay in the same size class from one year to the next than that he would move into any other single class. This occurs since the probability on the diagonal is larger than any other probability in the same row, with the two exceptions mentioned.

By studying Table 3 we can compare the relative stability of production in the different areas. Looking again at the 1-15 size group in the Bureau-Lee area, we can see that the probability of having no cattle in the following year is 0.327 and that of increasing to 16-30 head is 0.306. However, the probability of any increase from the 1-15 size group is $0.306 + 0.081 + 0.041 + 0.041$, or 0.469. This is in sharp contrast to the 1-15 size

Table 3. — Transition Matrix, Beef Feeders, 1946-1959^a

Size group in given year (head)	Size group in following year (head)								Sum
	None	1-15	16-30	31-50	51-70	71-100	101-200	Over 200	
Transition probabilities for Bureau and Lee counties									
None.....	.844	.014	.045	.046	.023	.013	.012	.003	1.000
1-15.....	.327	.204	.306	.081	.041	.041	.000	.000	1.000
16-30.....	.141	.077	.306	.347	.088	.035	.006	.000	1.000
31-50.....	.088	.011	.099	.458	.237	.088	.019	.000	1.000
51-70.....	.072	.004	.049	.117	.359	.256	.143	.000	1.000
71-100.....	.011	.000	.005	.057	.150	.461	.311	.005	1.000
101-200.....	.029	.000	.014	.029	.048	.149	.630	.101	1.000
Over 200.....	.048	.000	.000	.000	.000	.000	.079	.873	1.000
Transition probabilities for McDonough and Warren counties									
None.....	.781	.054	.047	.052	.026	.019	.019	.002	1.000
1-15.....	.187	.266	.250	.187	.063	.047	.000	.000	1.000
16-30.....	.144	.076	.424	.246	.068	.034	.008	.000	1.000
31-50.....	.181	.058	.145	.399	.094	.094	.022	.007	1.000
51-70.....	.056	.000	.056	.183	.282	.268	.127	.028	1.000
71-100.....	.069	.009	.017	.069	.094	.388	.335	.009	1.000
101-200.....	.051	.000	.010	.000	.071	.225	.541	.102	1.000
Over 200.....	.115	.000	.000	.000	.000	.000	.154	.731	1.000
Transition probabilities for Champaign and Piatt counties									
None.....	.926	.022	.016	.016	.009	.003	.008	.000	1.000
1-15.....	.558	.262	.148	.016	.000	.000	.016	.000	1.000
16-30.....	.222	.087	.407	.235	.037	.000	.012	.000	1.000
31-50.....	.235	.031	.061	.439	.214	.010	.010	.000	1.000
51-70.....	.059	.000	.078	.333	.294	.157	.079	.000	1.000
71-100.....	.174	.043	.000	.043	.174	.261	.261	.044	1.000
101-200.....	.093	.000	.000	.023	.069	.140	.535	.140	1.000
Over 200.....	.143	.000	.000	.000	.000	.000	.571	.286	1.000

^a Based on records of cooperators in Illinois Farm Bureau Farm Management Service.

group in Champaign and Piatt counties. Here the probability is only 0.180 that an operator in this class will increase his enterprise the following year. The probability that he will move out of the feeder business is 0.588. This reflects the decline of beef-feeder enterprises of this size in the Champaign-Piatt area.

For the 16-30 size class, the probability of an increase in the Bureau-Lee area is 0.476; of remaining in the same size group, 0.306; and of decreasing, 0.218. In McDonough and Warren counties, the probabilities are 0.356 for increasing; 0.424 for remaining constant; and 0.220 for decreasing. This indicates that producers in the 16-30 size group are more likely to increase their enterprises in Bureau and Lee counties than in McDonough and Warren. In Champaign and Piatt counties, producers in this same size group are more likely to decrease their operations (probability, 0.309) than to increase (probability, 0.284).

In Bureau and Lee counties there is more stability in the 71-100 size group (probability of staying in the same class, 0.461) than in the 16-30 size group (probability of staying in the same class, 0.306). Both in McDonough and Warren counties and in Champaign and Piatt counties, there is more stability in the 16-30 size class than in the 71-100 size class.

Other comparisons of this nature may be made from the transition matrices in Table 3. However, such comparisons involve essentially short-run considerations. That is, they seek to answer the question: If a producer is in a certain size group in a *given* year, what are the probabilities that he will be in each of several size groups the *following* year?

Equilibrium analysis. A more interesting question relates to the long-run

tendencies inherent in the set of transition probabilities for each area. Suppose that we start with a group of producers with varying sizes of enterprises in a given year. From this we can get the size distribution, that is, the number and percent of producers in each size class. A set of probabilities (transition matrix) such as the one in Table 3 can then be used to calculate the size distribution in the following year. Except under unusual conditions, this size distribution will be different from the one with which we started. We may again use the transition matrix to derive the size distribution for the next year and so on until an "equilibrium" is reached.² Because of its importance in indicating long-run tendencies, the notion of equilibrium is important in economic analysis. At equilibrium the system becomes stable, that is, the size distribution remains constant.

The steps from class to class that an individual producer goes through depend on (a) the class in which he starts and (b) the transition matrix of probabilities. Although individual producers may move from one size group to another after equilibrium has been reached, the size distribution remains unchanged. The number of producers entering a class each year is exactly equal to the number leaving that class.

The equilibrium size distribution that evolves assumes that the producers within a given size class are relatively homogeneous with respect to factors causing movement from one class to another. In essence, size of enterprise is used as an indicator of many other variables which influence the rates at which individual operations grow or decline.

Further, it is assumed that the forces

² Although this represents the logic of the computation, another technique was used in the numerical calculations. See Judge and Swanson, *op. cit.*, p. 4.

Table 4. — Percent of Farmers in Each Size Group of Beef Feeders

	Size group (head)								Total
	None	1-15	16-30	31-50	51-70	71-100	100-200	Over 200	
	(percent)								
	Bureau and Lee counties								
1946-1959 average..	42.8	2.3	7.8	12.4	10.4	10.0	10.7	3.6	100.0
Equilibrium.....	26.1	1.1	4.8	9.9	9.8	12.7	19.3	16.3	100.0
	McDonough and Warren counties								
1946-1959 average..	41.0	5.6	10.6	13.1	6.7	10.7	9.3	3.0	100.0
Equilibrium.....	32.3	4.3	8.7	11.3	7.1	12.5	16.0	7.8	100.0
	Champaign and Piatt counties								
1946-1959 average..	76.7	3.7	5.0	6.3	3.3	1.6	2.8	0.6	100.0
Equilibrium.....	73.4	3.1	4.0	6.8	4.2	2.3	5.0	1.1	100.0

that affected the producers in the sample during the period studied will continue to be dominant until equilibrium is attained. Of course, one does not expect the historic forces to continue strictly without change. Nevertheless, the differences outlined below in size distribution among areas give insights into the potential path of livestock adjustment.

Size distribution of beef-feeder enterprise. The average 1946-1959 size distribution and the equilibrium size distribution are shown in Table 4. In Bureau and Lee counties 42.8 percent of the account-keeping farmers fed no cattle, on the average, during the 1946-1959 period, 2.3 percent fed 1-15 head, 7.8 percent fed 16-30 head, etc. In equilib-

rium we see a decrease in percentage of producers with no cattle — from 42.8 to 26.1. Each size class below 70 head decreases from the 1946-1959 average to equilibrium, while those above 70 head increase.

The same general pattern holds for McDonough and Warren except that a larger percent of producers remain with no cattle than in Bureau and Lee counties. In Champaign and Piatt counties the percent of producers with no cattle drops very little, remaining quite high at 73 percent.

The distribution by percent of total production (rather than percent of producers) is in Table 5. In the equilibrium size distribution producers feeding over

Table 5. — Percent of Production in Each Size Group of Beef Feeders^a

	Size group (head)								Total
	None	1-15	16-30	31-50	51-70	71-100	100-200	Over 200	
(percent)									
Bureau and Lee counties									
1946-1959 average... ..		.4	3.6	10.1	12.6	17.2	30.1	26.0	100.0
Equilibrium.....		.1	1.0	3.7	5.5	10.1	25.1	54.5	100.0
McDonough and Warren counties									
1946-1959 average... ..		1.0	5.3	11.4	8.7	19.8	28.7	25.1	100.0
Equilibrium.....		.5	2.8	6.3	5.9	14.8	30.9	38.8	100.0
Champaign and Piatt counties									
1946-1959 average... ..		2.2	8.8	19.2	15.1	10.4	29.5	14.8	100.0
Equilibrium.....		1.4	5.1	15.0	13.9	4.7	38.3	21.6	100.0

^a Derived from Table 4 by using midpoint of each size group as the average of that group and the 1959 average for the over-200 size group.

200 head in Bureau and Lee counties account for 54 percent of total production—a doubling of their share of production in 1946-1959. A similar, but less pronounced, pattern holds for the other two areas.

Changes in Size of the Hog Enterprise

Table 6 gives the probabilities of change in hog production in each of the three areas. Again there are some contrasts. The probability of a farmer starting hog production is about the same in the Bureau-Lee area ($1.000 - 0.811 = 0.189$) as in the Champaign-Piatt area ($1.000 - 0.869 = 0.131$). Both of these are lower than in the McDonough-Warren area ($1.000 - 0.628 = 0.372$), where farmers in the sample have moved into production at a high rate.

A comparison of producers starting in the class of 21-40 litters per year shows a similar degree of stability among

areas in terms of staying in that class in the following year. However, the direction of movement from that class differs among areas. In Bureau and Lee it is balanced; that is, the probability of an increase ($0.177 + 0.027 + 0.003 + 0.002 = 0.209$) is equal to that of a decrease ($0.044 + 0.168 = 0.212$). The McDonough-Warren area shows a growth tendency with a 0.247 probability of increase and a 0.178 probability of decrease. In the Champaign-Piatt area the probability of a decrease is more than double that of an increase.

As another example, in the 61-80 litters class, the Bureau-Lee and McDonough-Warren areas are roughly similar in growth tendencies, differing sharply from the Champaign-Piatt area, where the probability of a drop in size is 0.858.

As in the case of the beef-feeder enterprise, more short-run comparisons

Table 6. — Transition Matrix, Litters of Hogs, 1946-1959^a

Size group in given year (litters)	Size group in following year (litters)							Sum
	None	1-20	21-40	41-60	61-80	81-100	Over 100	
Transition probabilities for Bureau and Lee counties								
None.....	.811	.135	.042	.000	.006	.000	.006	1.000
1-20.....	.126	.612	.225	.029	.004	.004	.000	1.000
21-40.....	.044	.168	.579	.177	.027	.003	.002	1.000
41-60.....	.017	.035	.262	.493	.175	.012	.006	1.000
61-80.....	.015	.031	.047	.256	.419	.178	.054	1.000
81-100.....	.019	.019	.019	.056	.132	.472	.283	1.000
Over 100.....	.000	.000	.016	.048	.081	.113	.742	1.000
Transition probabilities for McDonough and Warren counties								
None.....	.628	.159	.089	.062	.018	.026	.018	1.000
1-20.....	.188	.466	.295	.051	.000	.000	.000	1.000
21-40.....	.052	.126	.575	.218	.017	.009	.003	1.000
41-60.....	.064	.042	.184	.493	.171	.032	.014	1.000
61-80.....	.042	.008	.109	.294	.370	.143	.034	1.000
81-100.....	.064	.012	.026	.012	.180	.539	.167	1.000
Over 100.....	.000	.023	.000	.047	.209	.186	.535	1.000
Transition probabilities for Champaign and Piatt counties								
None.....	.869	.116	.013	.002	.000	.000 ^b	....	1.000
1-20.....	.166	.749	.079	.004	.001	.001	....	1.000
21-40.....	.071	.250	.543	.109	.027	.000	....	1.000
41-60.....	.074	.074	.204	.500	.148	.000	....	1.000
61-80.....	.143	.143	.215	.357	.071	.071	....	1.000
81-100.....	.000	.000	.333	.333	.000	.334	....	1.000

^a Based on records of cooperators in Illinois Farm Bureau Farm Management Service.
^b Over 80 litters.

Table 7. — Percent of Farmers in Each Size Group, Litters of Hogs

	Size group (litters)							Total
	None	1-20	21-40	41-60	61-80	81-100	Over 100	
	(percent)							
	Bureau and Lee counties							
1946-1959 average.....	18.0	25.0	27.6	16.7	6.8	2.6	3.3	100.0
Equilibrium.....	21.1	19.6	23.2	14.6	8.1	5.1	8.3	100.0
	McDonough and Warren counties							
1946-1959 average.....	11.7	15.8	30.4	19.9	10.8	6.9	4.5	100.0
Equilibrium.....	16.4	13.0	24.9	21.1	11.0	8.4	5.2	100.0
	Champaign and Piatt counties							
1946-1959 average.....	39.7	43.9	11.5	3.6	0.9	0.4 ^a	...	100.0
Equilibrium.....	51.9	34.7	9.3	3.2	0.8	0.1	...	100.0

^a Over 80 litters.

could be made but the tendencies of the three systems can best be seen by comparing the average 1946-1959 size distribution with the equilibrium size distribution.

Size distribution of hog producers. In contrast to the beef operations (Table 4) the percent of farmers producing hogs decreases in each area as we move from the 1946-1959 average size distribution to the equilibrium (Table 7). In Bureau and Lee counties only the percent of producers with more than 60 litters per year increases; in the McDonough-Warren area only those above 40 litters increase; while there was no increase in any class of production in the Champaign-Piatt area.

Apparently the economic and technical forces that are operating have a different impact on the hog enterprise than on the feeder-cattle enterprise. Feeder cattle are being integrated more easily into the going operations than are hogs. On many farms they can play the role of a supplementary enterprise to utilize labor and forage better than hogs can. This is especially true in such areas as McDonough and Warren counties where a substantial amount of nontillable pasture land is available. In 1960 the percentages of

farmland in nontillable pasture were as follows: McDonough-Warren area, 20 percent; Bureau-Lee area, 10 percent; and Champaign-Piatt area, only 4 percent.

Another factor favoring the trend toward broader participation of farmers in beef feeding than in hog production is the change in farm size. Census data show an increase from 1944 to 1959 of 15 percent in farm size in the Bureau-Lee area, 19 percent in the Champaign-Piatt area, and 27 percent in the McDonough-Warren area. If the land added in farm enlargement had at least some nontillable pasture, adding or increasing a feeder-cattle enterprise would have been an easier organizational change than the addition of hogs.

In addition to the preceding analysis of the annual litters of hogs produced, separate analyses were made of the farrowings by season. Two classes were studied. Spring pigs were considered to be those farrowed between December 1 and June 1 and fall pigs those farrowed between June 1 and December 1. In each of the three areas, the change from the 1946-1959 average size distribution to that of equilibrium was consistent with the results for the total annual number

of litters (Table 7). In equilibrium a slightly larger percent of farms were, in general, producing spring litters than were producing fall litters. For example, in Bureau and Lee counties 74 percent of the farmers remained in spring production at equilibrium while 68 percent remained in fall production.

When changes in size distribution are viewed in terms of the percent of production in each class (Table 8), Bureau and Lee counties show the most change from their present structure to equilibrium. While the Bureau-Lee and McDonough-Henderson areas are roughly similar in that over half of the production in equilibrium is from herds with more than 60 litters, only 7 percent of production in Champaign-Piatt is from herds of that size. The role of the small hog operations appears to be rather stable in this cash-grain area, with about 70 percent of the production from operations with less than 40 litters farrowed per year.

Specialization vs. Diversification

A frequently mentioned aspect of the changes taking place in agriculture is the increase in specialization. To gain infor-

mation on the trends in specialization in each area, the year-to-year adjustments were classified by a combination of beef-feeder enterprise sizes and litters of hogs. Transition matrices are not presented because of their large size, but the size distributions of farmers both for the 1946-1959 period and for equilibrium are presented in Table 9.

In the Bureau-Lee and the McDonough-Warren area, 25 classes were used. The percent of farmers in the Bureau-Lee sample producing neither cattle nor hogs was 11.1 in the 1946-1959 period but increased to 12.5 percent in equilibrium. Farmers producing 1-20 litters but feeding no cattle decreased from 12.3 percent to 7.4 percent; those producing no hogs but feeding 1-20 head of cattle remained constant at 0.6 percent, etc.

To analyze the trends, if any, toward specialization we adopt the following classification. Specialized farms are those (1) producing hogs in the absence of feeding cattle, and (2) feeding cattle with no hogs. Diversified farms are those with both hogs and beef feeders and the final class has neither kind of livestock.

In all areas farmers specializing in

Table 8. — Percent of Production in Each Size Group, Litters of Hogs^a

	Size group (litters)							Total
	None	1-20	21-40	41-60	61-80	81-100	Over 100	
(percent)								
Bureau and Lee counties								
1946-1959 average.....	...	8.2	27.0	27.2	15.5	7.5	14.6	100.0
Equilibrium.....	...	5.2	18.4	19.4	15.0	12.0	30.0	100.0
McDonough and Warren counties								
1946-1959 average.....	...	3.9	22.7	24.8	18.9	15.3	14.4	100.0
Equilibrium.....	...	3.2	18.2	25.6	18.7	18.1	16.2	100.0
Champaign and Piatt counties								
1946-1959 average.....	...	41.3	31.5	17.9	6.0	3.3 ^b	....	100.0
Equilibrium.....	...	40.3	32.4	19.7	6.6	1.0	....	100.0

^a Derived from Table 7 by using midpoint of each size group as the average of that group and the 1959 average for the largest (open-end) group.
^b Over 80 litters.

Table 9. — Percent of Farmers in Each Size Group, Beef Feeder and Hog Combinations^a

Hogs (litters)	Beef feeders (head)					
	None	1-20	21-50	51-100	Over 100	
(percent)						
Bureau and Lee counties						
None.....	1946-1959 average.....	11.1	0.6	1.6	2.2	2.8
	Equilibrium.....	12.5	0.6	1.6	2.9	5.4
1-20.....	1946-1959 average.....	12.3	1.6	5.4	3.8	2.2
	Equilibrium.....	7.4	0.7	4.3	3.4	3.3
21-50.....	1946-1959 average.....	15.5	1.8	8.2	7.4	4.6
	Equilibrium.....	8.0	0.9	5.4	7.8	8.0
51-80.....	1946-1959 average.....	2.7	0.5	2.8	4.3	2.3
	Equilibrium.....	1.8	0.3	3.0	6.1	3.5
Over 80.....	1946-1959 average.....	0.4	0.1	0.6	2.6	2.6
	Equilibrium.....	1.0	0.3	1.1	4.4	6.3
McDonough and Warren counties						
None.....	1946-1959 average.....	7.6	0.2	1.2	0.6	1.9
	Equilibrium.....	1.9	1.0	4.2	2.2	6.8
1-20.....	1946-1959 average.....	12.4	1.4	0.8	0.5	0.3
	Equilibrium.....	1.9	2.0	2.1	1.7	0.1
21-50.....	1946-1959 average.....	28.0	2.7	4.8	2.5	1.1
	Equilibrium.....	5.7	4.7	9.1	3.5	4.3
51-80.....	1946-1959 average.....	15.5	0.3	2.6	1.5	1.8
	Equilibrium.....	3.2	1.7	4.8	5.9	9.6
Over 80.....	1946-1959 average.....	6.9	0.3	1.2	1.7	2.2
	Equilibrium.....	2.6	0.7	1.6	6.5	12.2
Champaign and Piatt counties						
None.....	1946-1959 average.....	29.1	2.2	2.4	1.2	1.0
	Equilibrium.....	41.8	2.2	2.9	2.3	2.8
1-20.....	1946-1959 average.....	35.9	1.9	4.7	1.8	0.6
	Equilibrium.....	25.4	1.1	4.3	2.1	1.0
21-40.....	1946-1959 average.....	9.8	0.7	2.1	1.6	0.6
	Equilibrium.....	5.6	0.7	1.6	1.3	0.5
Over 40.....	1946-1959 average.....	1.8	0.2	0.3	1.1	1.0
	Equilibrium.....	2.3	0.1	0.3	0.5	1.2

^a Based on records of cooperators in Illinois Farm Bureau Farm Management Service.

hog production decreased from 1946-1959 to equilibrium (Table 9). The percentage of farmers producing only hogs in 1946-1959 is found in the column headed "None," which indicates no cattle. All the 1946-1959 figures in this column (except the first one, indicating no hogs) are added. Thus the percentage of hog specialists in 1946-1959 in Bureau and Lee counties is 12.3 + 15.5 + 2.7 + 0.4 = 30.9 percent. The equilibrium percentage is found in a similar way: 7.4 + 8.0 + 1.8 + 1.0 = 18.2 percent. In the McDonough-Warren area the percentage of hog specialists dropped substantially from 62.8 percent in 1946-1959 to 13.4 percent in equilibrium. The drop in the

Champaign-Piatt area was from 47.5 percent to 33.3 percent.

In contrast, the percent of beef-feeding specialists increased from 7.2 percent to 10.5 percent in the Bureau-Lee area; from 3.9 percent to 14.2 percent in the McDonough-Warren area; and from 6.8 percent to 10.2 percent in the Champaign-Piatt area. The increase in percent of farmers feeding beef cattle reflects a growing recognition that this enterprise can utilize labor in the slack season, as well as forage that would otherwise be unused.

The trend in the percent of farmers who have neither hogs nor beef is mixed. These may actually be cash-grain farm-

ers, dairy farmers, or any other type of farmer who has no beef feeders or hogs. In Bureau and Lee counties, farmers in this group show stability, with a very moderate increase from 11.1 percent in 1946-1959 to 12.5 percent in equilibrium. That is, there is a slight increase in those quitting production of beef feeders and hogs. The McDonough-Warren area shows a substantial drop in farms with neither hogs nor feeder cattle—a drop from 7.6 percent in 1946-1959 to 1.9 percent in equilibrium. The opposite occurs in the Champaign-Piatt area, with an increase from 29.1 percent in 1946-1959 to 41.8 percent in equilibrium.

The trend of diversification. The percent of diversified farms shows a strong tendency to increase in the Bureau-Lee area (50.8 percent to 58.8 percent) and an even stronger one in the McDonough-Warren area (25.7 percent to 70.5 percent). Even if those who drop out of hog production and cattle feeding specialize in some other line of production there is a decrease in specialization in terms of extrapolating the tendencies inherent in the sample in these two areas. The percent of diversified farms shows a slight drop in the Champaign-Piatt area, going from 16.6 percent in 1946-1959 to 14.7 percent in equilibrium.

Instead of looking at specialization in terms of the percent of farmers in each of the four broad groups (hogs but no feeder cattle, feeder cattle but no hogs, both hogs and feeder cattle, and neither cattle nor hogs), we can see another viewpoint by examining the percent of production in each group. (Table 10).

Considering first the hog production, we find, as we move to equilibrium, a drop in the percent of production by hog specialists (no beef in combination) in each area: Bureau-Lee, from 28.0 percent to 15.5 percent; McDonough-

Warren, from 66.8 percent to 16.3 percent; and Champaign-Piatt, from 65.7 percent to 62.6 percent. These movements are in the same direction as the percent of farmers that are hog specialists. Since it is obvious that the hogs that are not produced by the hog specialists are produced in combination with beef, there is an increase in each area in the percent of total production from diversified farms.

In beef production, the changes in production are not uniform. The percent of feeder cattle fed by the feeder-cattle specialists increases slightly in the Bureau and Lee county area—from 15.6 percent to 17.8 percent. It drops substantially in the McDonough-Warren area—from 21.5 percent to 10.9 percent, but increases in the Champaign-Piatt area from 27.2 percent to 44.6 percent.

The importance of the diversified farm in terms of total production is apparent. In equilibrium, over 80 percent of both beef cattle fed and litters produced in the Bureau-Lee area and the McDonough-Warren area come from diversified farms. In equilibrium in the Champaign-Piatt area about 37 percent of the hogs and 55 percent of beef cattle fed are produced on diversified farms.

Summary

The method employed in this report provides a description of the adjustments that beef and hog producers have made over the last 15 years. In particular, it provides a picture of the adjustments made by producers with different sizes of operations. In addition, the analysis provides some insights into the nature of long-run adjustments, assuming that the same forces generating the observed pattern of change will continue to operate. Thus the analysis provides both a de-

Table 10. — Percent of Production in Each Size Group, Beef Feeder and Hog Combinations^a

Hogs (litters)	Beef feeders (head)						
	Average and equilibrium	None	1-20	21-50	51-100	Over 100	
(percent)							
Bureau and Lee counties							
None.....	Beef.....	1946-1959 average	....	.11	1.03	3.03	11.43
		Equilibrium	....	.07	.68	2.62	14.45
	Hogs.....	1946-1959 average	....	....	....	....	....
		Equilibrium	....	....	....	....	....
1-20.....	Beef.....	1946-1959 average	....	.29	3.47	5.24	8.98
		Equilibrium	....	.08	1.81	3.07	8.83
	Hogs.....	1946-1959 average	3.76	.49	1.65	1.16	.67
		Equilibrium	1.88	.18	1.09	.87	.84
21-50.....	Beef.....	1946-1959 average	....	.33	5.28	10.21	18.78
		Equilibrium	....	.11	2.28	7.05	21.41
	Hogs.....	1946-1959 average	16.59	1.93	8.77	7.91	4.92
		Equilibrium	7.13	.80	4.81	6.95	7.13
51-80.....	Beef.....	1946-1959 average	....	.09	1.80	5.93	9.39
		Equilibrium	....	.04	1.27	5.52	9.37
	Hogs.....	1946-1959 average	6.19	1.15	6.42	9.86	5.27
		Equilibrium	3.44	.57	5.73	11.65	6.68
Over 80.....	Beef.....	1946-1959 average	....	.02	.39	3.59	10.61
		Equilibrium	....	.04	.46	3.98	16.86
	Hogs.....	1946-1959 average	1.48	.37	2.22	9.59	9.59
		Equilibrium	3.07	.92	3.38	13.52	19.36
McDonough and Warren counties							
None.....	Beef.....	1946-1959 average	....	.08	1.69	1.81	17.89
		Equilibrium	....	.13	.84	4.00	5.95
	Hogs.....	1946-1959 average	....	....	....	....	....
		Equilibrium	....	....	....	....	....
1-20.....	Beef.....	1946-1959 average	....	.56	1.12	1.50	2.82
		Equilibrium	....	.29	.98	4.57	9.23
	Hogs.....	1946-1959 average	2.84	.32	.18	.12	.07
		Equilibrium	.96	.39	.37	.81	.52
21-50.....	Beef.....	1946-1959 average	....	1.08	.67	7.53	10.36
		Equilibrium	....	.23	4.17	1.62	7.74
	Hogs.....	1946-1959 average	22.48	2.17	3.85	2.01	.88
		Equilibrium	3.84	1.07	5.56	1.01	1.54
51-80.....	Beef.....	1946-1959 average	....	.12	3.65	4.52	16.95
		Equilibrium	....	.56	2.13	.67	10.71
	Hogs.....	1946-1959 average	23.11	.45	3.88	2.24	2.68
		Equilibrium	.11	4.83	5.27	.77	3.95
Over 80.....	Beef.....	1946-1959 average	....	.12	1.69	5.12	20.72
		Equilibrium	....	.20	4.17	6.09	35.72
	Hogs.....	1946-1959 average	18.36	.80	3.19	4.52	5.85
		Equilibrium	11.37	3.14	18.43	12.54	23.52
Champaign and Piatt counties							
None.....	Beef.....	1946-1959 average	....	1.48	5.67	6.06	13.98
		Equilibrium	....	1.12	5.16	8.77	29.56
	Hogs.....	1946-1959 average	....	....	....	....	....
		Equilibrium	....	....	....	....	....
1-20.....	Beef.....	1946-1959 average	....	1.28	11.08	9.09	8.39
		Equilibrium	....	.56	7.66	8.01	10.55
	Hogs.....	1946-1959 average	30.99	1.64	4.06	1.56	.52
		Equilibrium	28.37	1.23	4.80	2.35	1.12
21-40.....	Beef.....	1946-1959 average	....	.47	4.95	8.08	8.39
		Equilibrium	....	.36	2.85	4.96	5.28
	Hogs.....	1946-1959 average	25.38	1.81	5.44	4.14	1.55
		Equilibrium	18.76	2.35	5.36	4.36	1.67
Over 40.....	Beef.....	1946-1959 average	....	.13	.71	6.26	13.98
		Equilibrium	....	.05	.53	1.91	12.67
	Hogs.....	1946-1959 average	9.37	1.04	1.56	5.73	5.21
		Equilibrium	15.49	.67	2.02	3.37	8.08

^a Derived from Table 9 by using midpoint of each size group as the average of that group and the 1959 average for the largest (open-end) group.

tailed description of what has happened and a means for projecting these adjustments into the future.

The results in this report indicate that the producers studied in Bureau and Lee counties represent a rather stable agricultural system as we project toward an equilibrium. The Champaign and Piatt county area shows somewhat less stability, and the McDonough-Warren area exhibits a strongly dynamic pattern of change.

Prospects for changes in the size distribution of the beef-feeding enterprise, as based on the sample of record-keeping farmers, are a general pattern of increase in the number of farmers feeding at least some cattle. This tendency is strongest in the Bureau-Lee area. The greatest increase in the very large operations (over 200 head) is also likely to occur in that area.

Changes expected in the structure of hog production are of a different nature. The percent of farmers producing hogs shows a tendency to decrease in each area. The trend appears more pronounced in the McDonough-Warren area than in either of the other areas. As with the beef-feeder enterprise, the greatest increase in the very large operations (over 100 litters) is projected in the Bureau-Lee area.

In addition to a study of adjustments in the size distribution of the beef-feeder and hog enterprises considered separately, an analysis of diversification was undertaken.

Farms having *both* beef feeders and hogs show a slight tendency to increase as we shift toward equilibrium in the Bureau-Lee area, a tendency of similar strength in the opposite direction in the Champaign-Piatt area, and a very substantial tendency to increase in the McDonough-Warren area. Thus in two of the three areas an increase in the percent of diversified farms is expected.

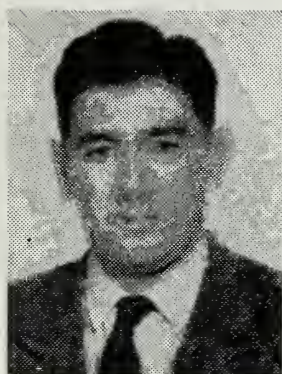
The pattern of change projected for hog specialists (feeding no beef cattle) is uniform among areas — the percent of such farmers drops in all areas. On the other hand, the percent of farmers feeding cattle with no hogs tends to increase in all areas, although this group makes up a rather small fraction of all farmers.

The picture that emerges cannot be simply characterized as a trend toward specialization in livestock production. In the important livestock areas (Bureau-Lee and McDonough-Warren counties) the projected trend indicates an increase in the percentage of farms that combine hog and cattle operations.

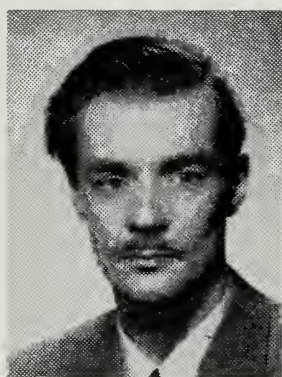
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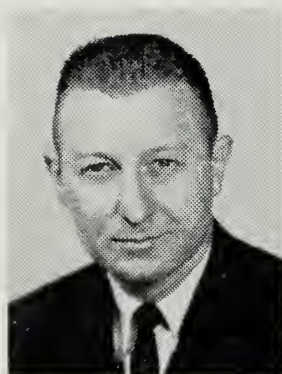
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